...GHT, FEBRUARY 6, 1936

FIRST AERO WEEKLY IN THE WORLD

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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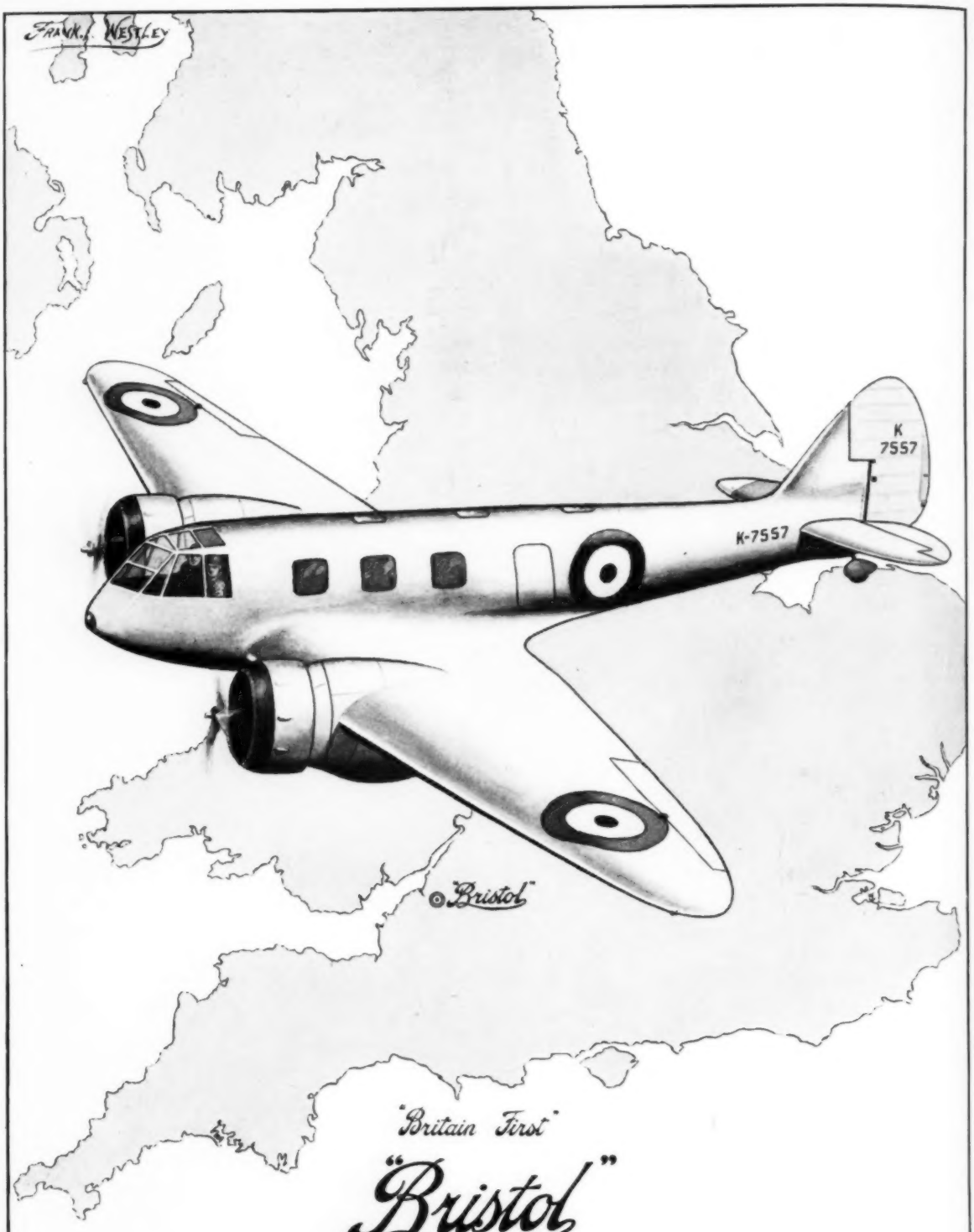

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Melting Pot

THE text of the Bill which is shortly to be introduced into Parliament, and which it is hoped will become the Air Navigation Act, 1936, has now been published, and its main features are given on page 141 of this issue. With the section of the Bill which provides for compulsory third party insurance, *Flight* has already dealt fully in its issue of November 21 last, and there is no need to revert to that subject. The other most important provisions in the Bill are (1) the increase of the permissible subsidies for civil flying from one million to a million and a half per annum, and the extension of the period during which subsidies may be paid from the end of 1940 to the end of 1953; (2) the setting up of a board, as recommended by the Gorell Committee, to take over from the Secretary of State certain functions in regard to the design, construction and maintenance of civil aircraft; (3) the regulation where necessary of air transport services in the United Kingdom by Orders in Council, after the draft of each order has been laid before Parliament; and (4) the elimination of the Air Council from the control of civil flying.

The increase of the permissible amount of subsidy is chiefly necessary because of the prospects of starting trans-Atlantic air services before long. In addition to this, some branch services off the main Empire routes have now become desirable, and there is no doubt that others will be needed before very long. Imperial Airways are now beginning trial flights on the branch service from the main African airway to Kano and the West African colonies. Another branch line by Imperial Airways is to serve Malta and will also traverse the northern coast of Africa to Egypt. There is also the possibility of a subsidy being granted to a British firm for a service to the Baltic countries, though nothing has yet been decided. The allocation of more money for subsidies was certainly necessary, as subsidies are still unfortunately indispensable, and it is sound policy to provide for the granting of long-term contracts.

The acceptance of the Gorell Committee's recommendation of a board to take over various functions as regards civil aircraft is naturally popular with the parties concerned, and as it was fully discussed in these columns at the time when the report of the Gorell Committee was published, there is no need to say anything more about it now. Nor is there much to be said about the provision for regulating air transport routes by means of Orders in Council. It has long been felt that some rationalising of inland air services was to be desired, for in the last few years there has been a tendency for too many companies to run air services on the same routes. Competition within reason is good for trade, but not as a rule in the case of an infant industry. Such industries need protection—even Adam Smith admitted that principle—and the policy of the Hambling Committee in granting a monopoly of subsidies in Europe to one company has been amply justified by results. Working by Orders in Council might put too much arbitrary power into the hands of the Government were the safeguard not provided that the draft of the Order must first be laid before Parliament, which is the ultimate court of appeal in safeguarding the rights of subjects.

The Air Council

The elimination of the Air Council from control of civil flying, and the transference of the Council's powers to the Secretary of State is a salutary move, though in actual practice it is less revolutionary than it seems at first sight. The Air Council consists of the Secretary of State, the Under-Secretary, and the four Air Members of Council. These four are all serving officers of the Royal Air Force. Just after the Armistice, when Sir Frederick Sykes was Controller of Civil Aviation, he was also a member of the Air Council, but when the office was graded down to that of a Director, Sir Sefton Brancker was not made a member. It has recently been suggested that the Director-General of Civil Aviation should be made a member, but the suggestions showed an ignorance of the practical working of the Air Ministry. The Director-General has, as the Director always had, direct access to the Secretary of State, and that is a much

more useful privilege than membership of the Council would be. It would be a waste of his valuable time to have to attend discussions on Air Force questions. Likewise the four Air Members have no desire to waste their time in discussing the problems of civil flying. Practically the two departments of the Air Ministry work quite separately, but it was certainly illogical to leave the Air Council in even nominal charge of civil flying. Perhaps on some future date a cross-grained Air Vice-Marshal might have felt his fingers itching to interfere with matters which were rightly no concern of his. That danger, however unlikely it may have been, has now been removed, and the Secretary of State, working through the Director-General, will now be solely responsible for civil flying.

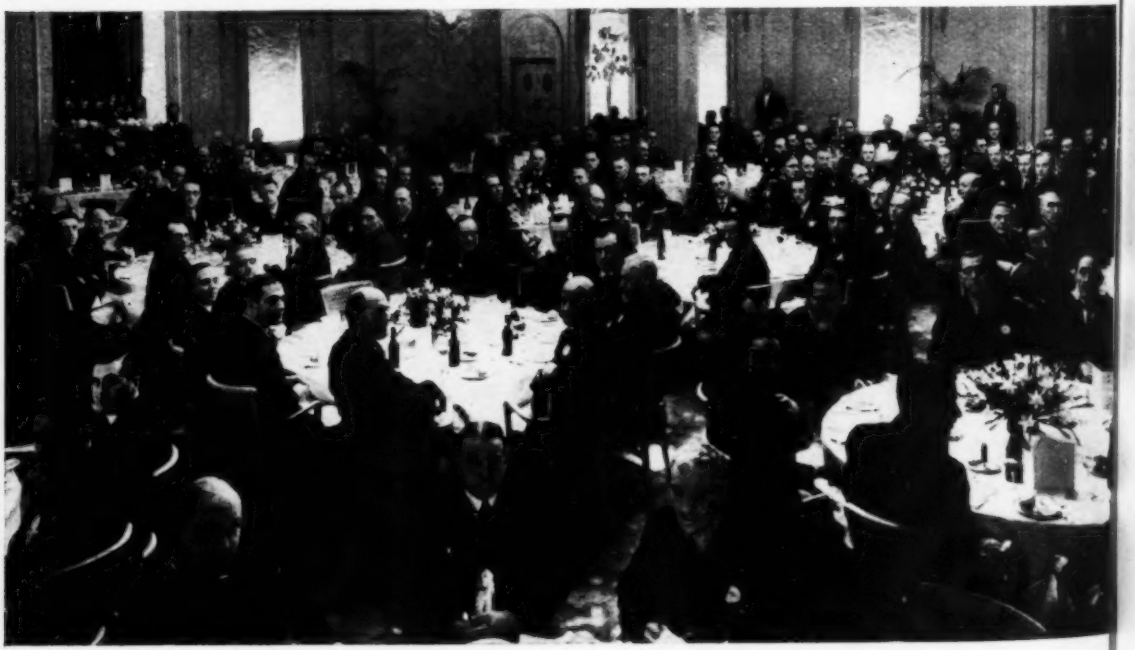
A Check from Australia

While things are going on in a satisfactory way in Britain, it is somewhat of a cold douche to hear that the Government of Australia has rejected the Home Government's proposals for a through service by flying boat to Sydney, combined with the compulsory carriage of all first-class mail matter by air at an Empire flat rate of three-halfpence for a half-ounce letter. It seems that the Australian Post Office supported the proposals of the Home Government, while the Defence Department opposed it, and carried the day. In Australia all flying, both Air Force and civil, is under the control of the Defence Department.

At the time when the scheme was made public we commented that, while the flying boats would have to follow the coast from Darwin to Sydney, it was not conceivable that the inland services of the old Qantas throughout Northern Queensland should be allowed to drop. They have proved very valuable to the grazing districts served, and, once a farming community, otherwise very isolated, has come to depend on air services, it would be the height of cruelty to deprive it of that link with the centres of civilisation. In South Africa the new route of Imperial Airways will also lie along the coast down to Durban, but the Union Government is willingly taking the internal services under its wing. Australia declines to follow the same course.

The Preference of Qantas

The local company, Qantas Empire Airways, has more than hinted at its preference for flying boats as vehicles for crossing all the water which lies between Darwin and Singapore, although it has been quite satisfied with the work of the D.H.86's now in use. One would have imagined that the Government would have been only too pleased to see a flying-boat route established by a civil company round the Australian coasts. If Australia ever had to defend herself against a foreign attack, those bases would be very useful; and practical experience of flying-boat work on a somewhat different scale than that of the new but small Seagull amphibians and the two ancient wooden Southamptons which the R.A.A.F. possesses ought to be welcome. The main reason for the Australian Defence Department's objection seems to be that it wants to keep in its own hand all responsibility for the section of route up to Singapore. At present the contract for this has been granted to the Australian company, Qantas Empire Airways, and there seems no reason why that arrangement should not be continued in the new scheme, though the inland route would have to be treated differently from the coast route to Sydney. If it is really the case that Australia suggests that flying-boats should only work from Britain as far as Singapore, and that landplanes should then be used for crossing the East Indies and the Timor Sea, the idea is not likely to find favour with many passengers. It all seems mysterious, and we must await more definite information.



A SOCIAL INAUGURATION: On the opening day of the Airports Conference and Exhibition some 200 delegates were welcomed to London at an informal luncheon at Grosvenor House. At the top table, standing, is Councillor Ashley Hall, Chairman of the Conference, and on his right is Sir Robert McLean, Chairman of the S.B.A.C.

The Outlook

A Running Commentary on Air Topics

Landing Fees

THE subject of landing fees occupied a good deal of the time of the Aerodrome Owners' Association's meeting last Thursday. Not landing fees charged to commercial operating companies, but those charged—or not charged—to the private owner. There was considerable diversity of opinion, some of the representatives being in favour of offering free landings to all private owners, others (and they were not all Scotsmen!) considering it perfectly legitimate to charge everybody a fee.

On the one hand, it was argued that usually the visitor by air spent a good deal of money in the town served by the aerodrome, and that therefore he should not be charged for landing his machine. The other side pointed out that in most cases there was very good reason for charging a landing fee, as the visitor by air was nearly always supplied with weather forecasts and a course to his next port of call; not infrequently men were sent out to hold his wing tips while he taxied in; and he might or might not require refuelling.

A reasonable view seems to be that where an aerodrome is the property of a municipality, it may consider it good policy to forgo the landing fee from a private owner visiting the town. After all, it is the formality rather than the actual cash which is likely to be annoying. And, anyway, as one delegate pointed out amid considerable amusement, the air tourist may not happen to have any small change on him, and then it may take months to collect the bill for a couple of shillings!

Where an aerodrome is owned by an individual or by a private company there does not appear to be any very good reason why a landing fee should not be charged. After all, if a motorist decides to leave his car in a garage, he expects to pay a small sum for the privilege. The municipal aerodrome is, in a way, the equivalent of the car park, and the private aerodrome corresponds similarly to the garage.

Getting Down to It

TO the not-too-technically-minded the great merit of the paper read by Dr. Watts to the Royal Aeronautical Society last Monday was that, for the first time, a fairly simple picture was presented of the parameters of airscrew design. As Dr. Watts pointed out, there are a large number of permutations and combinations in airscrew design, but the set of curves he presented did in a remarkably simple manner show when a variable-pitch airscrew is worth while and when it is not. For that he deserves the thanks of those who do not readily follow complicated and tedious calculations.

Technicians may argue that by making the comparisons on static thrust, keeping the top-speed efficiency the same, the fixed-pitch airscrew is made to look worse than it is. The lecturer admitted that point near the end of his paper. His system did show extreme values, and any change in basis of comparison can only bring upper and lower values closer together resulting in a smaller gain of one type over the other. It is well to have a clear picture of what is the maximum one can hope for, and Dr. Watts did provide that picture.

Incidentally, it may be pointed out that the curves not only gave the justification for variable pitch, but also explained its somewhat belated arrival in this country. Until the pitch equalled or slightly exceeded the diameter there was little to be gained from the variable-pitch airscrew. Dr. Watts has, on occasion, been accused of being anti-v.p, to coin a new expression. His curves showed that at the time when this accusation was aimed at him there was, in truth, insufficient gain to be obtained to make the v.p. airscrew worth while. With modern high-speed aircraft it is a different matter.

Making Your Airport Pay

A *FRIEND* of ours—one whose distinctly exalted position in the aeronautical world makes him feel it necessary to remain anonymous in connection with what follows—puts forward a suggestion on that ever-topical subject of "How to make municipal aerodromes pay." He seems inclined to regard his brain-wave as "frivolous and heretical," presumably because it might shock the Official Mind—which is probably a recommendation in its favour straight away. Nevertheless, similar suggestions were made at last week's airport conference. Here are his ideas:

"The first reason for the aerodrome is to be a port at which aircraft can call. But is there any reason why it should not be turned to other uses in order to secure revenue?

"In America the experiment has been tried of making the airport an amusement centre as well as a port of call for aircraft, and the experiment has been successful in that it has secured considerable extra revenue for the airport owner. If this question is looked at dispassionately and if certain classes of people will only sink their prejudices against the factor of amusement, much might be done to make airports and aerodromes attractive centres to which people would go and spend their money."

Why Not Brighten It Up?

"*BRIEFLY*" (continues our friend) "the proposal I would like to expound is the following: Every municipality which owns an aerodrome should plan to make that aerodrome a good amusement centre. By amusement I do not mean roundabouts, coconut shies, and so on, but amusement in the sense of relaxation and sport. For instance, there could be, as already exists at at least one aerodrome in this country, a really pleasant swimming pool. There could also be a good restaurant where people could be certain of securing a pleasant dinner or lunch or other meals of a kind which would be different from the average roast beef and tinned fruit salad type of meal.

"Included in the restaurant there should, of course, be a bar. To the restaurant could be attached a dance hall and concert hall. There might be room on the surrounding land (which must, in any event, be kept free of buildings) for a municipal golf course. Again, what is to prevent the laying out of hard and lawn tennis courts? In the airport section of the aerodrome buildings, too, there could be a series of small shops which could probably be let at a good rental. An essential part of the organisation of this amusement centre would have to be a frequent and comfortable service of buses."

He sums up by pointing out the obvious moral—that you will attract people to your airport, that they will become interested in flying, and that they will then start to use the airport as passengers.

Continental countries—notably Germany—have worked on these lines for years. Why cannot we? More than once *Flight* has lamented the English tendency to treat an aerodrome, so far as the general public are concerned, as a cross between a powder magazine and a fever hospital.

Ideal Layouts of Buildings and Landing Area : Ancillary Services : Air Traffic Control

THAT the average cost of a municipal airport may well exceed £100,000 was revealed by Major R. H. S. Mealing in his talk to the Aerodrome Owners' Association last Friday. This figure included the preparation of the land, the provision of buildings and all facilities; and, said Major Mealing, nobody could claim that any airport in this country was over pretentious.

In the early part of his paper Major Mealing pointed out that the tendency of constructors of commercial aircraft was to build into their aeroplanes the greatest pay-load capacity that the airport permitted. The limit of the run to take-off was imposed by the cost of providing the runway. It was no use having long runways at some airports and not at others. There should be a standard length, not merely national but international, on which constructors could count and to which they could build.

With reference to the minimum requirements of the Air Ministry, Major Mealing mentioned that for airports of the future one ought certainly to allow 1,400 yards run in the main direction and not less than 1,000 yards in all others. These dimensions were effective ones after deducting the effect of obstructions. The necessity for one dimension being greater than the others was to permit of bad-weather landings in that direction. Bad-weather landings would be a necessity, as the cancellation of scheduled services had a damaging effect on traffic figures.

Not much attention had been paid in this country to the runway type of landing area, but modern aircraft were better able to land slightly out of wind, and much ground could be saved by planning an airport on the runway principle rather than by sterilising much land which was seldom required. By runway he did not necessarily mean the provision of an artificial surface, but rather a strip of firm and level ground along which aeroplanes might arrive and depart in safety. Major Mealing illustrated that statement by adding that the non-runway type of landing area might occupy as much as 300 acres, whereas the runway type required much less.

"Wedge" Building

Concerning the question of layout of buildings, Major Mealing said there were many advantages to be gained from employing the wedge formation (sometimes known as the Duval plan) rather than to permit the buildings to straggle along the perimeter and occupy a corner which might be usefully employed to lengthen the runway in that particular direction. The lecturer thought that, although it should by now be unnecessary to emphasise the advisability of not locating buildings in the line of important flightways, plans containing such basic errors continued to be submitted to the Air Ministry for approval. He then mentioned that the average cost of more than a dozen municipal aerodromes worked out at above £100,000. It was, he said, impossible to lay down standard figures, because the capacity of an airport to attract traffic was ultimately the extent to which aircraft were able to use it by day and night in all weathers. Unless this condition was fulfilled, the use of an airport would be limited.

The heads under which one could arrive at the eventual cost of the establishment of an airport were enumerated by Major Mealing as follows: purchase of land, preparation of land, hangars, administration and traffic buildings, other buildings, roads, transport, electrical equipment, radio equipment, and airport lighting equipment.

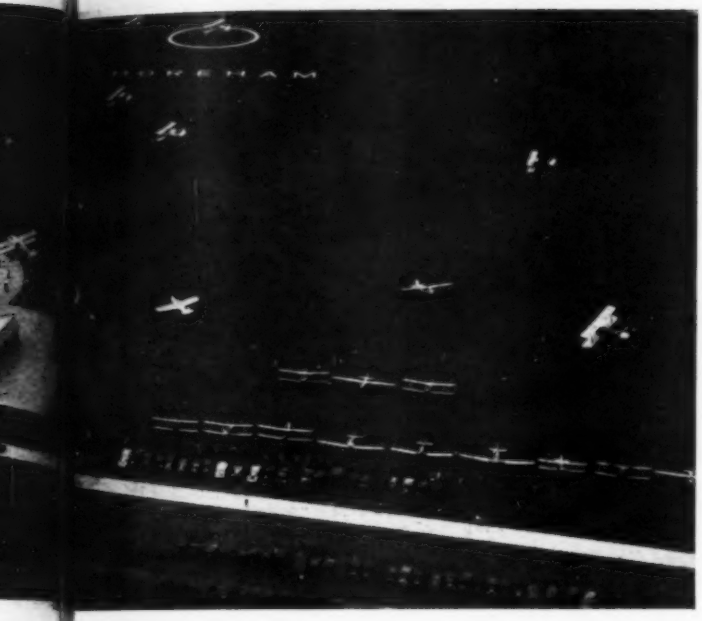
The capital cost and maintenance was considerable, but without it the airport would be of little use to the operator. Unless commercial air services could operate with safety in all weathers by day and by night, it was doubtful whether in the future they would have the chance of operating at all.

The new Brighton, Hove and Worthing Airport

The MODERN

Turning to the question of ancillary services, Major Mealing pointed out that one of the first of these was the provision of road transport between airport and town centre. At present the cost of transporting passengers to and from the airport was usually borne by airline operator. In one case the expense of this amounted to over 10 per cent. of the total cost of operating the airline. If the airport owner were to arrange for this transport, it would be an incentive for airline operators to use the airport. It was, of course, of importance to see that the running schedules fitted in punctually with the corresponding air services, as otherwise the time that had been saved at great cost in the air would be squandered needlessly on the ground.

Major Mealing also had something to say about radio communication and control. The Air Ministry had provided a certain number of radio stations which endeavoured to meet the requirements of the existing internal services. These had been located at certain airports, and served not only as homing stations for the airports but also as control centres for routes radiating from those airports. These stations not only transmitted and received weather reports and other messages but were all direction-finding stations. That was the system which had grown up, but already modifications were being considered. A certain number of suitably located main navigational radio stations would assist aircraft along an airway by providing weather reports enabling it to avoid collisions, providing positions, bearings, etc At each main airport station there might be short-range equipment, of, say, ten to fifteen miles range, to act purely as homing stations. As an improvement on present facilities the Air Ministry was, with the assistance of the N.P.L., carrying out research with the object of devising an automatic short-range station. This station would take the form of an ultra-high-frequency beacon which would at first at least assist an aircraft to approach an airport when horizontal visibility



(*Flight* photograph.)

ERN AIRPORT

was almost nil, and might in time become suitable for assisting the aircraft to land when the vertical visibility was practically nil. Major Mealing said that, as far as he could ascertain, there were no radio beacons in regular operation which enable a pilot to land an aircraft in circumstances when he cannot see the ground under him. There was more than one excellent blind *approach* beacon in regular use, but none was yet in regular use as a blind *landing* beacon. He thought in the near future the beacons would be able to serve both purposes.

On the subject of airport lighting, the lecturer called attention to the B.S.I. specification, and said that it was at present being revised in the light of modern requirements.

Major Mealing recorded the fact that the Air Ministry had found it difficult to get the average airport owner to submit proper plans of a potential airport and all its equipment, and even very difficult to get the owner of an existing airport to submit plans showing alterations which might affect the safety of aircraft. He recalled that unless this were done there was a possibility that any new building which interfered with the safety of aircraft using the airport might have to be ordered to be demolished. As a guide to what kind of plans should be submitted before any work was commenced, Major Mealing gave the following list: a layout plan of the landing area indicating its size, shape, and general conditions; any alteration to any existing landing area; any new buildings; any obstruction other than a building; layout plan of airport lighting equipment.

It was also advisable for any licensee to advise the Air Ministry of the erection of dangerous obstructions outside the airport for which he may not be responsible. There was also a great responsibility on the airport licensee to do all he could to protect the approaches to his airport under the various town-planning acts.

Some system of traffic control must soon be devised for any busy airport, Major Mealing said, and as a portent of what the future might hold for us in this country regarding traffic control he thought it might be of interest to quote from the regulations in force in Germany where internal air services were highly organised. The German air traffic control system divided the country into twelve safeguarding areas each in charge of a radio control station. Aircraft were not allowed to enter the zones without permission from the area radio control station. The area radio control and the aerodrome control zone stations were interconnected by an extensive land-line system. Under the German air traffic regulations international flight in cloud or fog was prohibited unless the aircraft carried blind-flying instruments, radio equipment, and a licensed operator. All avoidable flight in cloud or blind-flying practice was prohibited unless carried out with the approval of the Air Ministry. Flight anywhere over four large permanent and five temporary blind-flying areas by transport and sports aircraft was prohibited at defined distances above and below the clouds. The control officers operating the systems were ex-pilots licensed by the Government.

A Précis of the Paper Read by Major R. H. S. Mealing at the Airports Conference

The Discussion

With the exception of a certain amount of argument concerning the advisability of the Aerodrome Owners' Association passing a resolution that they should be given an opportunity to see the Maybury Committee's report before it went to Parliament, the discussion which followed Major Mealing's paper mainly took the form of a number of questions put to the lecturer. Of these the great majority referred to the latter's statement that in planning new airports a run of 1,400 yards in one direction and 1,000 yards in all others should be regarded as a minimum. Not unnaturally there was some uneasiness about the future, and more than one speaker pointed out that a few years ago a take-off run of 600 yards was officially laid down as a suitable minimum; now the corresponding figure was, apparently, 1,400 yards. Was there, it was asked, any guarantee that if towns and cities laid down new aerodromes having the larger dimensions, these in turn would not be considered inadequate in a few years? Where was it going to end? Obviously a stop must be called some time. The general feeling was that the Association wanted the Air Ministry to say what the requirements really were. The present uncertainty was causing many to hesitate to commit themselves.

Major Mealing's reply was that ultimately the decision rested with the public. If the public wanted high speed, the position was that this could only be provided by aeroplanes needing long runs.

Questions were also asked concerning the actual power which the Air Ministry had in dealing with such subjects as red lights on obstructions, high tension cables or pylons in the vicinity of aerodromes, and so forth. Major Mealing had to admit that the powers of the Air Ministry were frequently overrated. For instance, they could specify that chimneys, buildings and similar obstructions should be marked with red lights, but they could not *command* anyone to put up the lights and maintain them.

As regards the high-tension cables, the position was that the Air Ministry had a working arrangement with the Electricity Commissioners. Plans of grid cable routes were submitted to the Air Ministry, and if it was found that the route threatened to pass inconveniently close to an existing or projected aerodrome, an effort was made to get the route moved. The Air Ministry had had the greatest assistance from the Electricity Commissioners.

Complaints about noise were also dealt with. Major Mealing pointed out that the ordinary air navigation regulations about low flying did not apply within a radius of one mile from an aerodrome. Silencers were in existence, but they were rather heavy and their use reduced the payload.

One optimist shed a little light in what was, on the whole, a fairly gloomy discussion by stating that they need not be unduly alarmed about the long runways demanded. His experience had been that buying land for an airport could be made a paying investment. If more land had been acquired than was wanted it was usually found that the value had increased.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

"—TO PLOUGH AND SOW, TO LOOP AND ROLL—." Mr. J. W. Tomkins, a farmer of Apethorpe, Peterborough, Northants, is an aerobatics enthusiast and has bought himself an old Gloster Gamecock fighter and, from the R.A.F., a radial—which looks like an early Mercury or late Jupiter—for £7. The whole outfit cost him £25. Sword into ploughshare indeed!

BREGUETS are said to be working on a flying boat with a hull reminiscent of that of the Short Sarafand.

Four 1,100 h.p. Hispano radials will give it a speed of over 200 m.p.h. and allow an "overload" range of nearly 4,350 miles.

General Denain has presented the French Air Force with an eighty-piece band.

Bleriot is building a single-seater fighter biplane with a retractable undercarriage.

The Royal Air Force Display is being held this year on June 27. There is to be a set-piece once more.

Russia has accepted an invitation to send a number of parachutists to Paris to train French airmen in parachute jumping.

The P.Z.L. P.24 fighter, with a 900 h.p. Mistral Major and two *canons*, is being demonstrated to the Turkish Government.

Lieutenant-Colonel W. A. Bishop, V.C., has been appointed Honorary Air Vice-Marshal in the Canadian Air Force, being the first to hold the rank.

A glass bomb has been invented which is claimed to enable the pilot flying over water to measure his speed and drift. It spreads on the sea a film of aluminium powder.

The Swedish aircraft carrier *Gotland* visited Southampton on Saturday and has proceeded to London *via* Southampton.

While making a test flight near Antwerp recently the Stampe et Vertongen *multiplace de combat* sesquiplane crashed, killing its pilot, M. G. W. Ivanow.

General Denain, who was the French Air Minister in the Laval Cabinet, has been appointed inspector of the Overseas Air Force and a member of the Supreme War Council.

The dimensions of the Hawker monoplane fighter to specification F.36/34 are: Span, 40 ft.; length, 31 ft. 3 in.; and height, 11 ft. 3 in. Its engine is a Merlin "C."

Fifteen hundred inhabitants of Tangier Island, twelve miles off Chesapeake Bay, have been cut off from the mainland by dense ice floes. On Sunday an American airship landed with supplies.

A Real Sky Pilot

Father J. M. Couture, a Canadian priest, tends to the needs of a parish in Northern Ontario which stretches over an area of 200,000 square miles. In carrying out his missions of mercy he has flown over 50,000 miles, and now he is to have his own machine, having recently taken his ticket.

A War Goes On

So important are aeroplanes considered as insect fighters in Russia that seven and a quarter million acres are to be sprayed from the air in order to combat the mosquito plagues infesting the swamps and ponds. Breeding centres of locusts in Irania (Persia) are also to be met with insecticide bombardments from the air.

Noises Off

The B.B.C. last Monday night, in a feature entitled "Fog," let listeners hear the radio routine of bringing in an Imperial Airways liner in "QBI" conditions. It was excellently done—with the possible exception that the words "XC calling. I can now see the beacon and am coming in to land," were followed by an unfortunate crashing noise!

A Kingsford-Smith Theory

A Dutch pilot who has had wide experience on the Amsterdam-Batavia route has offered the theory that Sir Charles Kingsford-Smith was a victim of carbon monoxide poisoning from the engine. He recalls that on one flight "Smithy" experienced nausea which he attributed to sunstroke; it took him weeks to recover from the effects of the insidious poison.

Cast Off One—

"Speed" Westphal, the American gliding expert, has broken an unofficial world's record during the filming of a documentary picture showing the building and flying of motorless aircraft. Flying over Los Angeles at 7,000 ft. he did 102 m.p.h. for five miles. The old record was 68 miles an hour. Speed records of this kind are obtained by having the glider towed by an aeroplane and measuring the speed counted after the tow ropes have been cast off.

Twenty-five Years Ago

(From "Flight" of Feb. 4, 1911.)

"Continuing the series of tests with wireless telegraphy which are being made at Buc, on Maurice Farman biplanes, messages were successfully transmitted on the 23rd ult. over a distance of 12 kiloms., and it is believed that it would have been possible to transmit them over a distance of between 40 and 50 kiloms."

THE AIR NAVIGATION BILL

A Summary of the Important Clauses of the Bill Which is Shortly to be Introduced Into Parliament

THE text of the new Air Navigation Bill, which is shortly to be introduced into Parliament, was published last Friday, January 31. The following Memorandum, which accompanies the text, covers the more important provisions of the Bill. The part of the Bill which deals with compulsory Third-Party Insurance was fully dealt with in *Flight* of November 21, 1935.

Mention is not made in this Memorandum of Clause 20, under which the powers of the Air Council over civil aviation are transferred to the Secretary of State for Air.

Clause 1 empowers the Secretary of State for Air, with Treasury approval, to enter into long-term subsidy agreements for air transport services. It repeals the Air Transport (Subsidy Agreements) Act, 1930, which gave power to enter into such agreements within money and time limits which the new provision enlarges or extends. For the limit of £1 million which the Act of 1930 specified as the aggregate of the subsidies to be paid in any financial year it substitutes £1½ million. For the date, December 31, 1940, which the Act of 1930 specifies as that after which no such subsidy should be payable, the clause substitutes December 31, 1953.

Colonies and the Subsidy

The figure of £1½ million represents the maximum *gross* liability for any financial year which may be incurred by the Secretary of State under all such agreements. Any contributions which may be made by Dominion or Colonial Governments towards the cost of the subsidies will be appropriated in aid of Air Votes and will thus reduce the actual liability on United Kingdom funds.

It is estimated that the limit of £1½ million (gross) will cover the cost of the scheme of Imperial air routes announced in the House of Commons on December 20, 1934, and also the provision required for the inauguration and development of British air services across the Atlantic, for the maintenance and development of air services connecting the British Isles with other European countries, for the various feeder services which will be required to link up the main Empire trunk routes with outlying British territories, and for such other requirements as may arise.

Clause 2 empowers the Secretary of State to devolve certain of his functions in regard to the design, construction and maintenance of civil aircraft upon a Board representative of the civil aviation interests concerned. This measure of devolution arises from the Report of the Committee on Control of Private Flying and other Civil Aviation Questions (Cmd. 4654, 1934), under the Chairmanship of the Rt. Hon. Lord Gorell, C.B.E., M.C. The proposed Board, as the Committee recognised, cannot be self-supporting in its earlier years and will (in addition to receiving certain fees prescribed by law which are at present paid to the Secretary of State) require to be assisted from public funds. It is accordingly proposed that a subvention representing four-fifths of the total ascertained deficit on the Board's operations should be granted, for a period of five years in the first instance, from Air Votes. The expenditure likely to be incurred cannot be precisely estimated at the present time, but it is proposed that the payments from Air Votes should be subject to a maximum, to be settled with Treasury authority.

Clause 5 permits the regulation of air transport services and other commercial flying by licence, under Order in Council, when, and in so far as, such regulation may become desirable. The clause provides that before an Order can be made under the clause, the draft of the Order must have been approved by Parliament.

Clause 9 gives to those local authorities which have power to acquire land by agreement for aerodrome purposes, power to acquire such land compulsorily.

Clause 12 provides for the limitation of liability for third-party damage caused by aircraft. In the case of power-driven heavier-than-air aircraft, the limit of liability prescribed by this clause varies, according to the weight of the aircraft, from £5,000 to £25,000. A similar limitation in connection with international flying is provided for in the Convention relating to third-party damage caused by aircraft, which was signed at Rome in 1933 by this country and most of the other principal powers, but which has not yet been ratified. The adoption in this country of a system of limitation of liability, as an essential element of a scheme for compulsory third party insurance of aircraft, was recommended by Lord Gorell's Committee referred to above.

Clauses 13 to 17.—These clauses introduce a scheme of compulsory insurance of aircraft against third party risks in accordance with a recommendation of Lord Gorell's Committee. The corresponding provisions of the Road Traffic Acts, 1930 and 1934, have been followed as closely as possible.

Clause 18.—The Rome Convention of 1933 relating to third-party damage caused by aircraft covers the same ground as the provisions of section 9 of the Air Navigation Act, 1920, and of clauses 12 and 13 of this Bill, and the effect of the Convention is broadly the same. This clause enables the Convention to be given effect to by Order in Council.

The Rome Convention has been presented to Parliament in the form of a White Paper (Cmd. 5056).

Clauses 22 and 23 contain provisions which will facilitate the acquisition, administration and disposal of land and other property held, or to be acquired, by the Secretary of State for civil aviation and Air Force purposes.

Editorial comment on a number of the points raised by the Bill will be found on page 135.

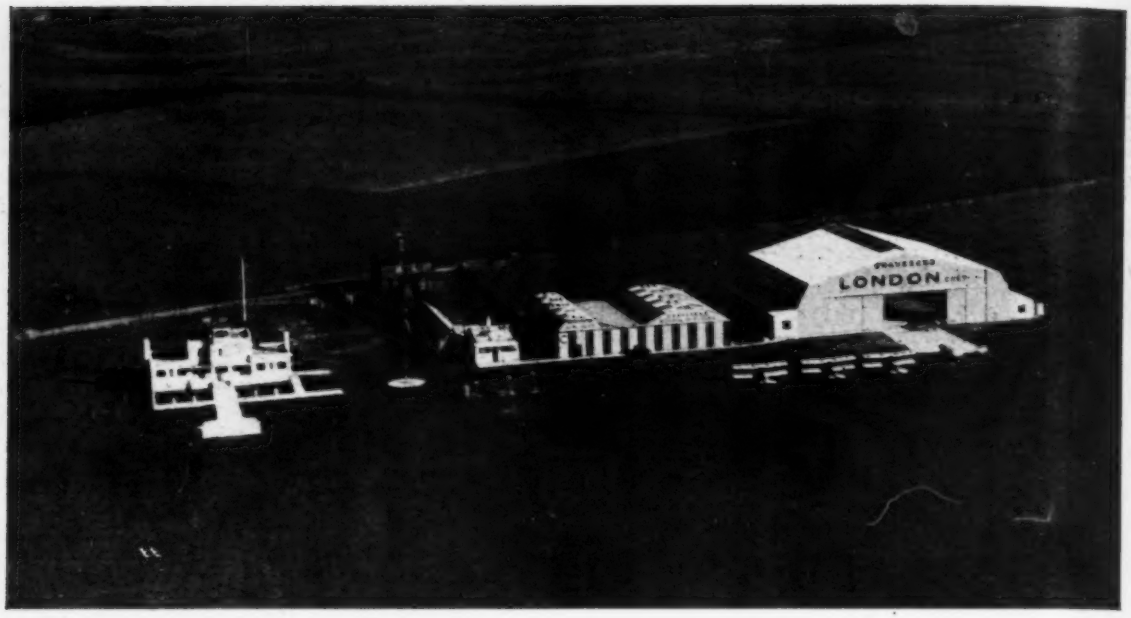
JOHN LORD—BY "A. V."

THE following tribute to Mr. John Lord (whose obituary appeared in last week's issue of *Flight*) has been received by the Editor from Sir Alliott Verdon-Roe, Mr. Lord's associate for very many years:

"In the death of John Lord I have not only lost a business partner, but a very dear friend. We have had many problems to solve, many anxious times together and many hearty laughs, but no quarrels. Naturally we were not always in agreement, but even on some of these occasions I subsequently found out that he really did agree with me, but wanted to hear as many anti-points as possible to confirm his convictions, apart from the fact he enjoyed seeing me expound a case.

"I think he had as great an affection for me as I had for him, a natural friendship that seemed to have started from the very first day we met, over thirty years ago, at that quaint old Manchester mill, Brownsfield Mills, so typical of Lancashire, which my brother H. V. took over from an uncle.

"As a rule I do not care to spend time dwelling on the past, because so much thought is required to deal with present and future activities. But poor John's death revives many cherished recollections. It was his cheerful self and, above all, his obvious sincerity, which endeared him to so many—qualities that will always be remembered by his numerous friends and many of those who have met him. He sometimes used to say in his jovial way: 'If A. V. had never been born it would have saved me a terrible lot of trouble.'"



Gravesend Airport—not municipal, but of pleasant aspect. (*Flight* photograph.)

THE PROVISION of MUNICIPAL AERODROMES

Broad Principles of a Topical Subject : A Precis of the Paper Read at the Airports Conference by Major Herbert Hamer, M.I.C.E., M.I.M.E., F.S.I., City Engineer, Hull

THE following remarks are designed to provoke a discussion with the object of a general exchange of views on broad principles of aerodrome development in this country. For the purpose of compiling the paper, statements made by recognised authorities have been taken and commented upon in as lengthy a manner as the limits would allow. The writer is well aware that notes of this character are lacking in continuity, but suggests it is one way of ensuring that the resultant discussion will be of more value than the paper.

STATEMENT I: *"Having regard to the vital need for the rapid development of airports, the aircraft industry should not wait for the municipal authorities but should develop the ports itself, and seek legislation to assist that development."*

By the expression "aircraft industry" it is assumed that both aircraft manufacturers and air transport operators are meant. Evidently the idea is that by establishing more aerodromes air traffic will increase, and thus the manufacturer will sell more aircraft to the ever expanding operator.

One difficulty that will have to be overcome if this idea is to be a success, is that the operators must run at a profit if they wish to put money into the aerodrome part of the business. It has recently been stated that, with two or three exceptions, air lines in this country are being run at a considerable loss. The majority of aerodromes are also being run at a considerable loss, and are likely to be so for some years yet.

Careful enquiries reveal that the average annual cost of municipal aerodromes receiving commercial aircraft is about £5,500 per annum, and the average annual income, approximately £250, including landing and housing charges and office rentals.

The question as to whether aerodromes should be provided by local authorities or by private enterprise has been the subject of discussion for some considerable time. It may be taken for granted that many local authorities would oppose the granting of parliamentary or other powers to private enterprise for this purpose.

A few observations may be usefully made on the subjects of reservation of land and of compensation. Section 8 of the Air Navigation Act, 1920, enables a local authority, with the consent of the Air Council, to acquire land by agreement and borrow money for this purpose. Apart from the Public Works Facilities Act there are no compulsory powers of acquisition as in the case of road, railway and dock undertakings, and no doubt the remedying of this deficiency would facilitate aerodrome development.

In some cases the price of agricultural land to-day is less than it was during the period immediately after the war, when many farmers acquired their property, and often it is found that the value of the mortgages is greater than the present-day valuation; it will therefore be seen that aerodrome sites are not easily acquired by agreement under such circumstances.

The compulsory acquisition of land by local authorities is a well established practice. Elaborate safeguards secure that the landowner shall make no profit out of the needs of those who themselves seek none. The compensation paid to the owner will cover the payment for the taking of the land acquired, and possibly for the injury done to remaining property. For this latter reason it is often cheaper to acquire the whole of a farm or an estate, even if it is not immediately required for aerodrome purposes.

In the United States and on the Continent, land adjoining the aerodrome is used for recreational purposes, and with the prevailing popularity of golf, tennis and other sports in this country there should be little difficulty in combining the two activities.

It is interesting to note that nearly seventy-five per cent. of existing aerodromes at home and abroad have been provided by local authorities, and there is reason to suppose that local

authorities are prepared to take the long view and to make provision for aerodromes, even at a present loss, providing there is a reasonable prospect of the land being progressively used.

STATEMENT II: *The vital need in the effective development of civil aviation is adequate ground provision which should be secured by the selection and reservation of sites by town planning authorities.*

This statement, as you will observe, is the opposite to the previous one, and here may be given some details of those delaying and discouraging influences previously mentioned.

The position of aerodromes in respect to town planning is described in the Ministry of Health's Circular No. 1305, dated March, 1933. The reservation of land for this purpose is suggested and advice is given on convenient access, freedom from obstructions, and the desirability of reserving land.

In actual practice the powers and facilities provided have been utilised only to a limited extent. Some of the reasons given by local authorities for the non-exercise of powers available in town planning schemes, are as follows:—

(a) The fact that compensation might be payable before they were ready to develop.

(b) They have been unable to ascertain whether an aerodrome would be used except by a few local flying enthusiasts.

(c) The possibility of any return for their money seemed remote.

(d) They have seen other authorities construct aerodromes under what appeared to be favourable conditions, only to find that the landing ground was useless without expansion which could only be made at excessive cost.

(e) The promises made by air transport operators have not materialised.

(f) In many cases where the town planning regulations have been used, any value has been lost by reserving sites obviously too small for anything but small landing grounds incapable of development into aerodromes of importance.

Propaganda

The majority of these difficulties can only be eliminated by suitable education, and every effort should be made to publish the right kind of propaganda for this purpose.

It is suggested that a film giving particulars of different classes of aerodromes, examples of the extent to which air traffic has already grown, and the advantages of air travel, should be prepared and distributed by the Association.

The Hull Airport Manager spends any available time in giving lectures to local authorities, chambers of commerce and trade, literary societies and secondary schools, and more of this kind of work is essential to remove misconceptions and make the public understand the significance of the British air transport industry, and therefore, take an interest in their local aerodrome, projected or established.

STATEMENT III: *A comprehensive plan is required for the development of aerodrome sites to meet national and local requirements.*

In the writer's opinion, such a plan is essential, not only for the guidance of all local authorities but for the benefit of air line operators as well, and as a means of enlightening the public generally on this very question of air transport.

Before a plan could be drawn up, a national survey would have to be made, and from this it would be possible to denote the national, regional and local requirements.

There appears to be ample precedent for national action in the establishment of the Ministry of Transport to develop road and bridge schemes, the appointment of Traffic Commissioners to control road transport services, the appointment of Electricity Commissioners, and the setting up of Catchment Boards by the Ministry of Agriculture and Fisheries.

One possible result of the survey might be the complete upsetting of preconceived notions as to the number and class of airports required. But this would be all to the good, for we have at the moment every kind of result of disjointed effort that it is possible to imagine.

Once local authorities know what is expected of them in a national scheme, they will in large measure supply the needs of the community, particularly if they are assisted by way of subsidy or grant from the National Exchequer.

If safety is the prime object of all this ground organisation, which it surely is, then the problem is a national one and should be treated accordingly. It is a lot to expect any municipality to buy an area of land, provide buildings of all kinds and lighting equipment, maintain the whole place, supply meteorological reports, and pay towards the upkeep of the wireless station where there is one, all on the revenue to be derived from the movements of a relatively few aircraft.

In these still early days, if it is agreed that the air transport industry as a whole is a particularly valuable one to this country, the lot of the aerodrome owner is the most costly and unremunerative of the three parties concerned, namely, the manufacturer, the operator, and the owner, and because in the main the ground organisation just described is to ensure safety, then it is not unreasonable to ask that a grant of say, fifty per cent. be given to cover the capital expenditure on the establishment of an aerodrome and the future maintenance charges.

Consideration of the average annual cost of an aerodrome, already referred to, and of the revenue obtainable under present conditions, are additional reasons for suggesting that a grant should be made.

If the sources of revenue are derived from landing and housing fees, passenger and cargo charges, petrol and oil sales, and office rentals, it would need roughly two hundred passengers every day of the year with proportionate luggage, three operating companies requiring offices, and six aircraft requiring petrol and oil every day to cover the previously mentioned average annual cost of £5,500. It needs very little survey of the present state of air transport to see how far we are from touching such traffic figures.

It comes to this: that although a number of new aerodromes are required at the present time in order to enable air transport to be developed and become really popular, the traffic at all but a very few of them will be small, and will take time to grow to the size mentioned.

Be it remembered that safety is required even when the traffic is small, which means considerable equipment and radio and meteorological services on a national and even international scale. Hence the heavy initial costs, and hence the argument for them to be shared in some proportion nationally.

The Discussion

During the discussion which followed the reading of Major Hamer's paper, the subjects raised were largely the same as those dealt with after Major Mealing's paper. Mr. Gandar Dower pointed out that there was a certain amount of hostility against private ownership of airports, and related briefly his own experience with the Aberdeen aerodrome. Fortunately for him, failure met the effort to pass a Bill which would have given the city the right to acquire Dyce at fourteen days' notice. He was now on the best of terms with the corporation, but there were many pitfalls to be guarded against, and private enterprise seemed to be suspected of attempting to establish a monopoly.

One speaker suggested that the railways should be approached and an effort made to establish aerodromes close to railway lines so that instead of competition one could get co-operation between the two forms of transport.

Major Hamer did not think much good could be achieved along those lines, pointing out that the railways were already in the field. As regards Hull, he had recommended the acquisition of a piece of land one and a half miles square, and further land outside that area should it be needed in future. Past experience with docks had shown that they did not pay for the first twenty years or so. Similarly, in aviation they had to take the long view and should not expect an airport to pay at once.

INSTRUCTORS' CERTIFICATES IN BLIND FLYING

AFTER March 31 competency to instruct in blind flying will form part of the tests for the instructors' certificate and the existing practice of endorsing the instructors' certificate will be discontinued.

From September 30 all instructors who wish to renew their certificates will be required to prove that they are qualified to give blind-flying instruction. Copies of the revised conditions of issue and renewal will shortly be available on application to the G.A.P.A.N. It is a condition precedent to the granting by the Air Ministry of an instructors' endorsement on the "B" licence that the instructors concerned should hold a current Guild certificate. Failure, therefore, to comply in due course with these requirements may cause the Air Ministry to cancel the endorsement.

A NEW RECRUIT

The Latest Type of Avro Cadet : More Power and Strength

THE Royal Australian Air Force and Air Service Training, Ltd. have lately adopted a new type of Avro Cadet for training purposes. Designated the Avro 643 Mk. II, the machine differs in comparison with its progenitor in that it has a more powerful engine, has been strengthened up, incorporates detail refinements and has an aerobatic C. of A. for a gross weight of 2,000 lb. This latter innovation (the all-up aerobatic weight of the elder Cadet is only 1,800 lb.) enables the machine to carry such equipment as permits it to be used for training with a fixed camera gun or camera in addition to its more normal function as a flying training type. So it is a very attractive proposition to an air service in which economies are being practised and should, in addition, suit the requirements of a certain section of private owners.

Structurally it resembles the earlier staggered Cadet, which means that the main planes and tail unit are of wooden construction. The fuselage is of welded-steel-tube construction with wooden fairings and fabric covering. A large portion of the fabric is removable for inspection.

Both spars have been made more robust, not having been spindled to the same extent as in the earlier type of wing, and as the result of a re-arrangement of the bracing wires the whole wing cellule is more rigid torsionally. Of these the lift wires now run from the bottom front fuselage joint to the top front interplane strut joint ; from the latter point to the bottom front wing root fitting ; and another travels thence to the top rear interplane strut joint. Anti-lift wires lead from the top wing roots to the lower front interplane strut joint. The tail plane is stronger than before.

Exit with a parachute from the front seat is still a matter of ease owing to the arrangement of the wires and the provision of side doors.

Frise ailerons are fitted to upper and lower planes and Handley Page slots with controlled locking may be embodied if required. Other items are : full dual instruments and blind flying hood ; night-flying equipment (the navigation lights may be of the single type or of the Demec three-in-one variety) ; dual-operated Bendix brakes permitting instruction in braking ; a fully castering tail wheel interchangeable with a tracking skid consisting of a laminated steel spring with a replaceable shoe ; and tankage for 26 gallons of fuel. Greater use has been made of ball bearings in the control system. The rear seat is now adjustable.

The engine is the Siddeley Genet Major 1A seven-cylinder radial rated at 150 h.p. at 2,200 r.p.m. and de-

AVRO CADET TYPE 643 MK. II.

TWO-SEATER LIGHT TRAINING BIPLANE.

Armstrong Siddeley Genet Major Mk. 1A ; 150 h.p. at 2,200 r.p.m.

DIMENSIONS.

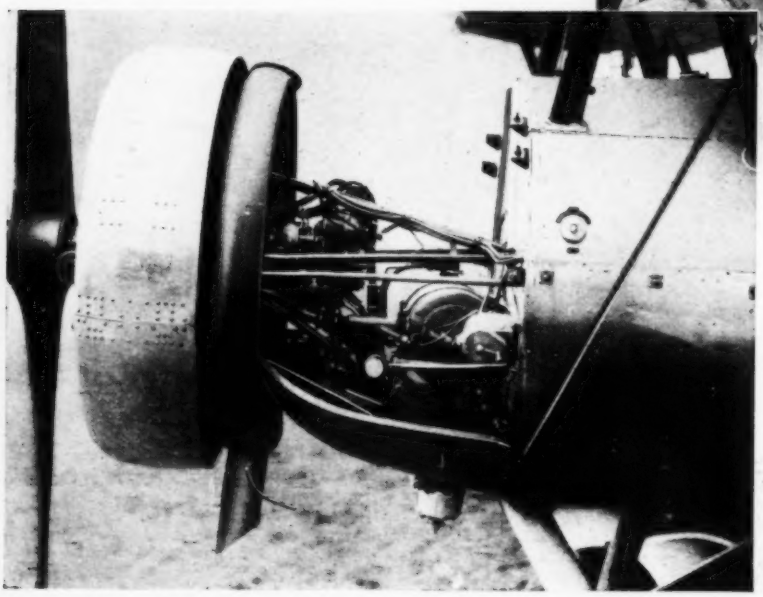
Span	30 ft. (*9,14 m.*)
Height	8 ft. 10 in. (*2,7 m.*)
Length	24 ft. 9 in. (*7,55 m.*)
Chord	4 ft. 9 in. (*1,45 m.*)
Gap	5 ft. (*1,52 m.*)
Wing area	262 sq. ft. (*24,40 m²*)

WEIGHTS AND LOADINGS.

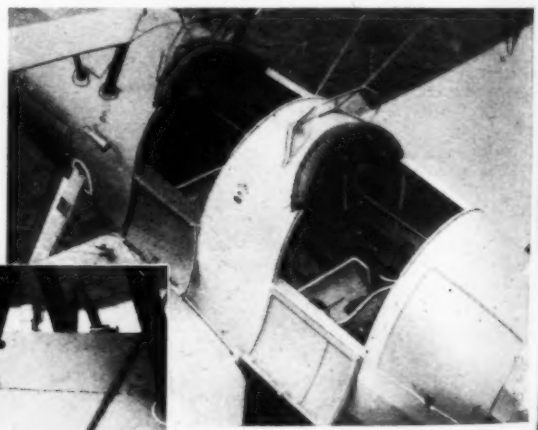
Tare weight	1,286 lb. (*583 kg.*)
All up weight (aerobatic C. of A.)	2,000 lb. (*907 kg.*)
Wing loading	7.63 lb./sq. ft. (*37,3 kg/m²*)
Power loading	13.32 lb./h.p. (*6,05 kg/h.p.*)

PERFORMANCE.

Maximum speed at sea level	116 m.p.h. (*187 km/hr.*)
Maximum speed at 10,000 ft. (3,048 m.)	104 m.p.h. (*167 km/hr.*)
Stalling speed	43 m.p.h. (*69 km/hr.*)
Duration at cruising speed	3.25 hr.
Rate of climb at sea level	700 ft./min. (*3,55 m/sec.*)
Climb to 10,000 ft. (3,048 m.)	26 min.
Service ceiling	12,000 ft. (*3 660 m.*)



The grouping of the accessories behind the engine and the ease of access to them for maintenance purposes is visible here. Note the oil cooler. (*Flight* photograph.)



Ease of exit by parachute is desirable in a training aeroplane and is not lacking in the new Cadet. This view shows also the capacious luggage locker. (*Flight* photograph.)

In external appearance the 643 Mk.II resembles the ordinary staggered Cadet. The re-arrangement of the bracing wires is visible in this view. (*Flight* photograph.)

livering a maximum of 165 h.p. It is mounted six inches further forward than that in the older Cadet, but retains the Townend ring (this is in two halves and is easily removed) and exhaust ring behind the cylinders. Other features are an oil cooler, a petrol system arranged for inverted flying, and a metal airscrew.

Provision is made for the installation of a Hythe Mk.III camera gun on the bottom plane. When this is fitted the machine is used only as a single-seater. There is also allowance for the mounting of a P-7 camera beneath the fuselage in a streamline fairing which, it is claimed, does not affect the tail trim. The tail trimming gear, incidentally, has larger operating wheels than before.

The wide-track undercarriage has oleo shock absorbers with steel springs in compression to absorb rebound and taxying shocks.

AN INFLUENCE for GOOD

Some Interesting Points Made by Sir Philip Sassoon in Opening the Airports Conference

ADDRESSING an assembly of delegates, exhibitors and others at the opening last Thursday of the Airports Conference and Exhibition, Sir Philip Sassoon, Under Secretary of State for Air, conveyed to his audience Lord Swinton's regret that he (Lord Swinton) had been unable to attend. He went on to speak of the tremendous progress made by aviation in a quarter of a century. This period had seen mechanical flying developed from a dangerous experiment into a deadly engine of war and a still more potent factor—as he hoped and believed the future would prove—for overcoming the obstacles of distance and drawing together the nations of the world in peace and understanding.

It was to promote and assist the beneficent influences of flying, said Sir Philip, that they were met there that day. No man could yet visualise with any pretence of accuracy the effect which air communication would have upon the future of the world. But they believed that its influence must ultimately be for good. In that hope they must and would make their plans.

Sir Philip said that for many years he had been a constant advocate of more municipal aerodromes—he was not sure that in some quarters he had not come to be regarded as a minor nuisance on that account. He knew that he had let no opportunity go by to preach to all who would listen the vital need for the local authorities of our cities and bigger towns to secure sites while favourable sites were still available and to equip them as aerodromes as soon as they could.

Speaking of the Aerodrome Owners' Association, Sir Philip pointed out that under its present title it was still in its first year. For a yearling it had a sturdy growth. He congratulated Mr. Ashley Hall and all who had co-operated with him upon the success of their efforts to make this a really large and representative Conference, and upon the magnificent yet essentially practical nature of the Exhibition which accompanied it.

He congratulated also the 200 delegates who had had the wisdom to attend, and those whom they represented—but particularly those who represented municipalities which already had aerodromes. Those municipalities which had made an early start in this matter would never regret it. Those who had gone there to learn he congratulated too; he was sure that they would go away with only one idea in their minds, namely, to provide aerodromes as quickly as possible.

But keenness to provide oneself or one's town with an aerodrome was only half the battle. The indiscriminate building of aerodromes all over the country might very easily have harmful results. Organisation and co-operation were very necessary. A most useful part of the work of the Association was that it acted as a centre for the pooling of knowledge.

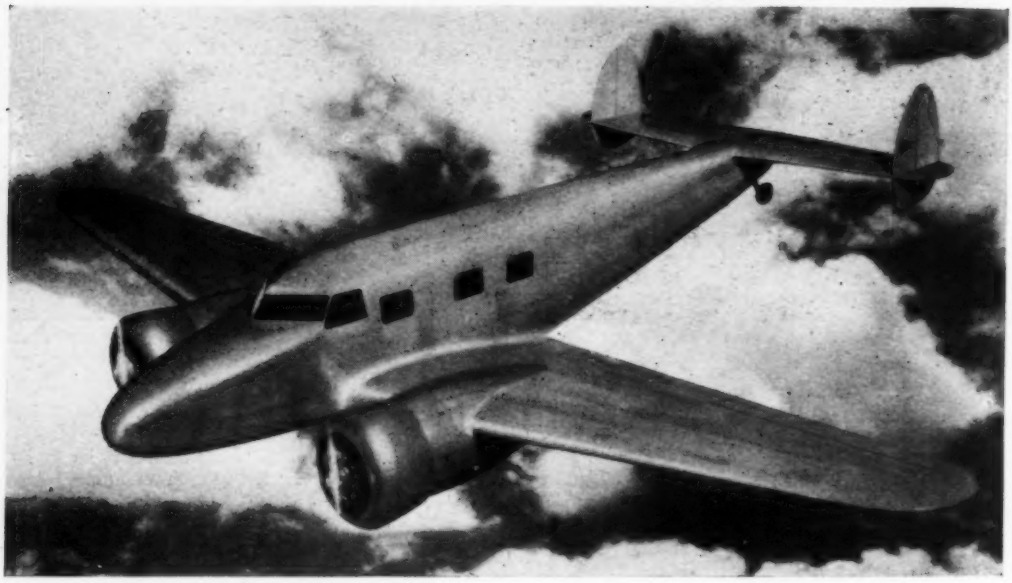
There was a lot more in the making of an aerodrome than the mere clearing of a large space of level ground. Some, indeed, of those who started first had learnt that to their cost; but there was no excuse for going on making mistakes when once the necessary experience had been gained and was available. The necessary knowledge *had* been gained and the business of the Association was to make it readily available to all those who wished to use it—as well as to persuade to use it those who had not yet quite made up their minds. He was particularly glad, therefore, to know that one of the first acts of the Association was to compile a really useful and informative handbook for guidance of those who had decided to make aerodromes.

Stanavo—Universally

AS from last Saturday, February 1, the brand-name of the Anglo-American aviation fuels has been changed from Esso to Stanavo, thus linking up the company's products in this country with their world-wide distribution network. Those flying abroad, incidentally, may obtain Stanavo products anywhere under the Carnet system.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —



STAR-DUST : That the Lockheed Model 12 is descended from the Electra is readily apparent here. A description of this smaller version of the famous Electra appears on p. 148.

THE WEEK AT CROYDON

Civil Ceremonial : The Municipal Visitation : For Our Descendants' Amusement : Press Delays—at a Price : An American Connection

WHEN mentioning the two minutes' silence last week, I omitted to place on record the fact that, as two services were due to depart at 1.30 p.m., the silence was observed on the tarmac by the crews of the two machines, who were lined up before their respective aeroplanes. I noticed in one case that the pilots and uniformed staff stood bareheaded, whereas in the other case the uniformed staff stood at the salute.

There are strict regulations in the services for such occasions, of course, and no doubt the Merchant Service also has its regulations. We of the civil aviation merchant service already have our traditions, and very fine ones, too, but we have not yet quite got down to "ceremonial drill."

After the second maroon had been fired, an Air France machine made a remarkably quick getaway. Considering that the passengers had not embarked until after the silence, it was more like a conjuring trick than a scheduled departure.

Several of the notabilities who attended the funeral left Croydon again by air afterwards. Amongst them were Prince Axel of Denmark, who flew to Paris by Imperial Airways, and Emir Said, Iraqui minister in Berlin, who represented King Ghazi at the funeral and afterwards flew to Berlin by D.L.H.

Delegates attending the Airports Conference, which was in session in London, visited Croydon on Friday night, where they were treated to a display of dazzling lighting and fireworks which officially I must refer to as pyrotechnics. Some quiet amusement was afforded me by a remark by a municipal airport owner who suggested that limits should be set to the size of landing areas so as to compel manufacturers to produce machines with no landing speed to speak of, and yet with a very high cruising speed.

This, mark you, came almost immediately after the extremely sound, practical and helpful paper read by Major R. H. S. Mealing (who knows more about airports and their construction than most people in this country) in which he pointed out that every airport should be planned so that it could be developed by progressive stages to meet future demands, and that it should comply with the requirements of modern commercial aircraft. I suspect that the airport owner in question has so planned things that his airport cannot develop, so transport companies, he thinks, should conform to his ideas! The answer is easy. If airports do not give the necessary facilities, air transport companies just go elsewhere.

Incidentally, I hear that the delegates left Croydon firmly convinced that *all* their aerodromes were far better than the London Terminal Aerodrome—which has a most unfortunately craggy appearance under the floodlighting, owing to the various ravines and huge rounded slopes which make landing so very interesting.

K.L.M., by the way, lately had to clear an unusual film through customs. It was of life in Denmark to-day, and after exhibition in London it is to be returned, by Scandinavian Air Express, to Denmark, where it will be locked in a safe for 100 or 200 years, to show Danes of times

to come how their forebears lived. I am of the opinion that a film of Croydon aerodrome should also be placed in cold storage for a century or so. After all, good comic films are still bound to be much sought after.

After the Royal funeral, of course, there was great activity in the matter of Press photographs. Most companies had quite large consignments, and "Surreys" sent machines to Paris and Manchester almost simultaneously. The motor cyclists who bring these photographs from Fleet Street to the Airport do not exactly linger by the wayside, but as their tendency is to start a little after the time when they should arrive they are apt to delay departing aircraft. Companies do not wish to disappoint them, so one, if not two firms will now delay their machines—at a cost of £1 per minute. This has gone a long way towards obviating such delays.

Capt. O. P. Jones, of Imperial, left Croydon on January 26 with *Daedalus* for Khartoum, whence he will fly to Kano, halfway between Khartoum and the Gold Coast, as recorded below.

Mr. F. W. J. Grant, of Surrey Flying Services, is now on his way back from a business tour in America, and Mr. McDonald, of "Surreys," tells me that he 'phoned Mr. Grant at Detroit and it is expected that this enterprising firm will have done good and extremely interesting business in the States. Incidentally, Mr. Grant's booking for a flight along one of the American air routes, which was made through Imperial Airways in London, was one of the first to be made in advance on this side for an American air line.

At present there is considerable Air Ministry activity outside the hangars occupied by Rollasens, and the steep gradient, which has prevented big aircraft from using the hangars with safety, is being removed. This should relieve housing congestion considerably.

A. VIATOR.

A Douglas for Australia?

IT is reported that Holyman's Airways, the company which operates services between Melbourne and Tasmania, has purchased a Douglas D.C.2, which is being shipped over this month with an engineer and a pilot.

D/F at Southampton

YET another airport is to be equipped with radio direction-finding equipment—Southampton. Since Portsmouth is already so equipped and is one of the key D/F stations in this country, Southampton's station will be of the short-range type. Radio Transmission Equipment has obtained the contract and the installation was, in fact, exhibited on the R.T.E. stand at the Airports Exhibition. This company is also erecting one of the short-wave radio beacons at Croydon.

Blind Approaches at Farnborough

TWO special Monospar 25s have been made and equipped for experiments in radio blind approach which will be made by the wireless flight at Farnborough. The machines are fitted with full dual control and the seat normally occupied by the first pilot has been most ingeniously hooded and has a very complete instrument layout.

An American Lear direction-finding set is fitted, with a visual indicator and fixed loop, as well as a Sperry artificial horizon and directional gyro, a standard Reid and Sigrist turn indicator, a Kollsman sensitive altimeter and a Smith rate of climb indicator.

The London-Lisbon Service

ON Saturday one of Crilly Airways' Fokker F.12 machines left Croydon for Lisbon to inaugurate the first passenger, freight and mail service between England and Portugal, the contract for which was signed in December between the British company and the Portuguese Postmaster-General. The machine reached Madrid on Saturday afternoon and proceeded on Sunday morning to Lisbon, where, at an official ceremony, the grand-daughter of the President named the liner *Lisboa*.

A regular daily service from Croydon to Lisbon was due to start on Monday, leaving Croydon at 6 a.m. and Lisbon at 8 a.m.

Ramsgate's Airport

SINCE an official opening has not yet been arranged there must be quite a large number of owners and club pilots who are unaware that Ramsgate's airport is now in full running order—and has been since July 1, 1935.

This airport is owned, of course, by the Corporation, and is leased to Ramsgate Airport, Ltd., whose directors are Messrs. Whitney Straight, R. J. B. Seaman and F. A. S. Gwatkin. The manager is Flt. Lt. C. E. Eckersley-Maslin, who will be remembered by commercial people as holding, until quite recently, the position of air superintendent with Jersey Airways.

The area of Ramsgate's airport is being steadily increased, and the present dimensions are: north to south, 850 yards, and east to west, 860 yards, of which 750 yards are at present in use. There is a small temporary hangar available for general use, but the construction of the permanent buildings has now started. Customs facilities and fuel supplies are available.

Towards West Africa

THE various negotiations have now progressed to a sufficient extent to enable Imperial Airways to send the first machine to Khartoum in readiness for a survey flight to Kano. Although work is progressing rapidly, the condition of the West African aerodromes beyond Kano is such that it will not be possible to operate as yet beyond that point.

It is expected that on the delivery flight the D.H.86 *Daedalus* will call at El Obeid, El Fasher, Geneina, Abesher, Ati, Fort Lamy, Maidugari and Kano, returning by the same route to Khartoum. The aircraft will be under the command of Capt. O. P. Jones. He will have a crew of two, and on the survey flight Major H. R. P. Reynolds, Mr. V. G. Crudge (Imperial Airways) and Flt. Lt. R. F. Durrant, A.F.C. (Air Ministry) will be carried.

The machine left Croydon on January 26.

Birmingham's Airport

HAVING once decided that an airport will, in future, be an essential feature of every town or city of any importance, Birmingham has lost no time and has resolutely refused to spoil the ship for a ha'p'orth of tar. Some 640 acres of land have already been purchased or have been the subject of purchase arrangements.

The site, as already recorded, is at Elmdon, which is about seven miles from the centre of the city, and is on the main Coventry road, more or less to the south of Castle Bromwich aerodrome. Plans for the terminal buildings and hangars, which will lie on the south-east boundary, are already well advanced, and the longest run of the initial landing area will be well over 1,300 yards. Later extensions will provide runs of nearly 2,000 yards.

The whole district has been thoroughly surveyed and the airport will eventually have one of the most unobstructed series of approaches of any aerodrome in the country. For half a mile beyond the boundaries no serious obstructions will be permitted. The final scheme involves a sum of very nearly half a million pounds.

Another Link

A FRIENDLY agreement has been reached between two companies of outstanding repute, whose air lines will link up at Liverpool. Olley Air Service, through a subsidiary, Blackpool and West Coast Air Services, has operated services in the North of England and to Belfast with conspicuous regularity for the last two years or so.

This company will, next summer, operate services between Liverpool, the Isle of Man, Belfast, Dublin, and London, and at Liverpool there will be a connection with the Liverpool, Doncaster, Holland and Scandinavia services operated by British Continental Airways in conjunction with K.L.M.

This will involve the arrangement of time-tables to suit, as far as possible, the schedules of both B.C.A. and Olleys, and the link between Ireland and the Continent, *via* Liverpool and Doncaster, should be of immense future importance to Ireland.

The arrangement between these two English firms will have considerable significance to those who are studying the situation in aviation at all closely, for behind these two companies there are some important financial groups. One may venture to guess that the present friendly arrangement is likely to grow into a much closer bond in the near future. Union is strength in aviation to-day, and companies which make no alliances, or which make foolish ones, will inevitably fail.

Commercial Aviation

Reliability

ON Monday of this week D.L.H. celebrated the second anniversary of the South Atlantic mail service. The original fortnightly service has become weekly, and machines have crossed no fewer than 143 times without casualty and almost without trouble.

Replacing the "Golden Clippers"

FOR the past three years Wibault-Penhoët three-engined "Golden Clippers" have been flying on Air France's Croydon-Le Bourget service. It would seem that these will soon be replaced, since the first Breguet-Wibalt 670, which was described and illustrated in *Flight* of April 25 last year, has now been in the air for some time.

This machine, which has two Gnome Rhone K.14 engines, is an 18-seater, and, with retractable landing gear and v.p. airscrews, it has a top speed of 210 m.p.h. at 6,000 ft. At 4,500 ft., using 62.5 per cent. of the available power, it cruises at 175 m.p.h. The 670 has slotted flaps which are somewhat similar in their action to the rather more accentuated flaps on the Junkers Ju.52's.

Air France Increases

EVIDENCE of the steady progress maintained in the public's use of air transport is contained in the 1935 figures which have been issued by Air France. The survey reveals a 29¼ per cent. increase in passengers over the 1934 records, a 28¾ per cent. increase in mail, and a 25¼ per cent. increase in freight. Actually, 62,036 passengers were carried.

A regularity of 98 per cent. was maintained during the year over the whole Air France system, which comprises the European network, the North African lines, the long-distance service to the Far East, and the 9,000-mile Atlantic service.

By Air to Medina

AS far back as November, 1933, Misr Airwork sent a machine into the Hedjaz, when one of the company's pilots, Mr. J. Mahoney, flew a D.H. Dragon from Almaza to Jeddah *via* Tor, Wedjh and Yambo, carrying Talaat Harb Pasha, managing director of the Misr Bank and director of Misr Airwork S.A.E., and party. In December, 1934, two machines, a D.H. Dragon, piloted by Mr. G. S. Brown, and a Fox Moth, piloted by M. Sidki Effendi, were despatched from Almaza to Jeddah by this route.

At the beginning of this year Talaat Harb Pasha and his party left Almaza on Thursday, January 9, in a D.H. Rapide for Jeddah, where they arrived on the same day after flying for 6 hours 33 minutes, stops being made at Tor and Yambo. On Saturday, January 18, the party left Jeddah for Medina, which they reached after a flight of 1 hour 45 minutes. Two days later, on January 20, they flew from Medina *via* Yambo in 5 hours 40 minutes.

That of 1933 was the first civil flight to the Hedjaz. That to Medina in January was the first civil flight to this Holy City, and it is believed that the machine is the first ever to visit Medina.

Still More Air Mail

THE fact that the amount of air mail has increased is almost ceasing to be news. Increases should be expected. Nevertheless, it is worth recording the fact that during 1935 the total weight despatched amounted to 187 tons, as compared with 122 tons in 1934—an increase of about 54 per cent.

Germany and the North Atlantic

DURING this month, it is understood, a German delegation representing the Air Ministry, the Post Office, and D.L.H. will be visiting Washington in connection with a proposed North Atlantic service. These plans appear to have no connection with the experimental airship flight which may be made with the L.Z.129 in due course. Presumably, if a service is contemplated, flying boats will be used with one or more depôt ships—as on the markedly successful South Atlantic service.

Plymouth-Jersey

JERSEY AIRWAYS expect to inaugurate a new service between the island and Plymouth on April 3. It is also anticipated that the company's private aerodrome on Alderney will be completely ready by Easter, after which calls will be made, on request, at that island by machines on the Southampton-Jersey-Southampton route. Guernsey Airways, a subsidiary company, also hope to recommence their inter-island amphibian service in the near future.

Towards Scandinavia

BRITISH AIRWAYS' Scandinavian mail and passenger service will, it is learnt, be inaugurated during the third week of this month, and tentative plans are being made for the first machine to leave on Monday, February 17. One trip will be flown daily in each direction.

The provisional time-table calls for departure from Stapleford Abbotts at 9 a.m., arriving in Amsterdam for an early lunch at 11 a.m., in Hamburg at 1.25 p.m., in Copenhagen at 3.20 p.m., and in Malmö at 3.45 p.m. In the reverse direction, the machine will leave Malmö at 8.30 in the morning, arriving at Essex Airport at 3.15 p.m. During the summer, as already announced, the service will be increased by the addition of a night service in each direction daily.

Although the service will, in some respects, be competing with those of the national air line companies in the countries served, Major McCrindle states that he has made arrangements for British Airways to work harmoniously with them. The national air lines concerned will, in some cases, act as the company's general agents. At Malmö this will be done by the A.B. Aerotransport, at Copenhagen by D.D.L., and at Hamburg by D.L.H.

Commanders W. F. Anderson, D.S.O., D.F.C., the senior pilot of British Airways, and C. M. Pelly have been assigned to the route, which will later be extended to include Stockholm when the new airport is opened. On the Malmö-Stockholm section, incidentally, there will be a regular series of beacons and emergency landing grounds.

A SMALLER LOCKHEED "TWIN"

The Type 12 With a Maximum of 231 m.p.h.: Four Models Available

IN view of the success enjoyed by the twelve-seater Electra (more than fifty of these machines are in use, the Lockheed Aircraft Corporation has introduced a new machine—an eight-seater—on similar lines but somewhat smaller.

Aluminium alloy (24 ST) is mainly used for the structure. The fuselage is a monocoque type and the wing resembles that of the Electra. The twin fins and rudders which, it is claimed, made for superior stability and control in the Electra, have been further improved for the Lockheed 12.

Four models are being offered. There is the type 12A, with two Pratt and Whitney Wasp Junior SB's (450 h.p. for take-off and 300 h.p. for cruising); the 12B, with a pair of model R975E3 Wright Whirlwinds (these are intended for low altitude operation and give 440 h.p. for take-off and 300 h.p. for cruising); the 12F, using the smaller seven-cylinder type Whirlwind; and the Model 12M, with two Menasco six-cylinder in-line engines giving 290 h.p. each and 195 h.p. for cruising.

Although the new machine is smaller than the Electra, its fuselage is of approximately the same cross section as that of the larger machine; the maximum width is actually five feet. Aft of the cabin are lavatory facilities and a baggage compartment of thirty-three cubic feet capacity. The cabin is completely soundproofed and embodies a ventilation system similar to that of the Electra.

For airline operation six passengers are carried in adjustable seats; there is a crew of two and storage for 450 lb. of cargo in the rear compartment and in the nose.

LOCKHEED 12A

Two Pratt and Whitney Wasp Junior SB: 300-450 h.p. Twin-engined Commercial Monoplane.

Span	49ft. 6in.
Length	36ft. 4in.
Wing area	352 sq. ft.
Weight empty (including equipment and radio)	5,355 lb
Gross weight	7,925 lb.
Take-off run (2 posn. airscrew)	780 ft.
Take-off run (constant speed airscrew)	600 ft.
Maximum rate of climb at sea level	1 400 ft./min.
Fuel consumption at max. rated cruising power	52 gal./hr.
Cruising range (approx. 60% power)	650 miles.
Service ceiling	24,800 ft.
Absolute ceiling with full load on one engine	10 200 ft.
Maximum speed at sea level	219 m.p.h.
Maximum speed at 5,000 ft.	231 m.p.h.
Cruising speed at 10,000 ft.	209 m.p.h.

A new fighter type ordered in large quantities under the expansion scheme—the Gloster Gladiator. (*Flight* photograph.)

ACCORDING to PLAN

A Review of the Progress of the Royal Air Force Expansion Scheme to Date : Personnel Requirements Satisfied : Aircraft Industry's Response : New Aerodromes and Training Schools

IN 1914 Lord Kitchener, on taking over the office of War Minister, called first for half a million men for the Army. The men themselves were readily forthcoming, but the great problems were how to house them in barracks, to clothe them in uniform, to arm them, and to train them. Each was a great difficulty, but gradually each was overcome. The present expansion scheme of the Royal Air Force is not on the same stupendous scale, and it is not being carried out with the same vital need for speed, but, none the less, there are points in common between the two great efforts.

The problems which have lain before the Air Council may be divided into four categories: first to find the personnel, secondly to supply the aircraft, thirdly to provide stations, barracks, and aerodromes, and fourthly to arrange for training both pilots and mechanics. The opening weeks of a new year are an appropriate occasion for examining the methods adopted by the Air Council and the progress made in the eight months since the beginning of the great effort.

Let us first consider the way in which the aircraft problem has been tackled. The decision to expand came at a time when a large proportion of the existing squadrons of the R.A.F. were due for re-equipment with new and improved types of machines. In this connection it should be made clear that this expansion scheme is mainly concerned with Air Defence of Great Britain. Quite frankly, it has been undertaken in answer to the tidings that Germany had defied the Treaty of Versailles and had built up a powerful flying corps. That made it necessary for Britain to set her defences in order. For that reason the expansion scheme should be considered as confined to the squadrons of fighters and bombers in the Command A.D.G.B. New squadrons of flying boats, or of general reconnaissance aircraft which can do the work of flying boats, will generally increase the strength of Britain just as new cruisers will do, but they do not strictly belong to this expansion scheme. Likewise any increase

"It was rightly felt that the aircraft firms could deal with the large orders required." Hart Trainers under construction. (*Flight* photograph.)

The Hawker Hind light bomber (Kestrel V), ordered in large quantities as a replacement of the Hart. (*Flight* photograph.)

in squadrons stationed overseas which may take place are outside this particular scheme.

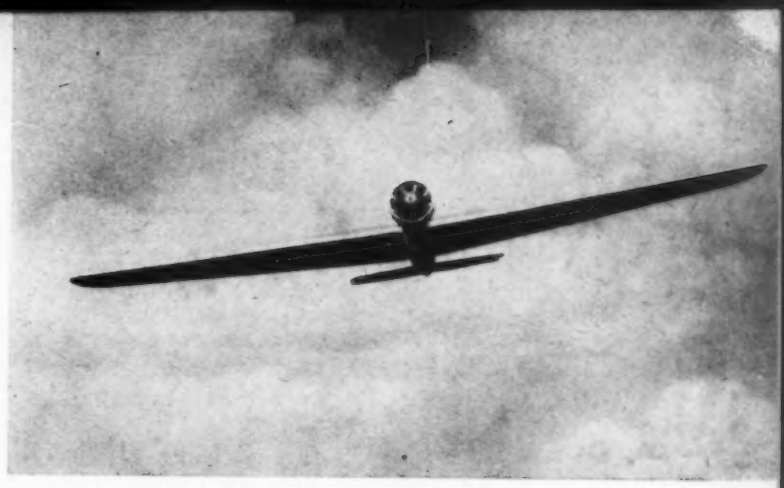
For a long time past the Air Ministry has been actively considering schemes for expanding the aircraft industry to meet the needs of a war. Air Commodore Charlton presided some years ago over a committee which went thoroughly into this subject. The scheme is naturally kept secret. In any case, it was not found necessary to put it into force to meet the present effort. It was rightly felt that the aircraft firms could deal with the large orders required. For some years past the need for economy had left the firms with very much less work in hand than they desired, and though they had to increase their output somewhat suddenly, they were not asked to undertake anything abnormal. Lord Weir consented to act as adviser to the Air Minister in regard to questions of arranging the supply and distributing the orders among the aircraft firms. When he was himself Air Minister he proved an expert at that sort of organisation.

As re-equipment of existing squadrons was necessary, as well as provision for new squadrons, the first orders had to be for types which were already in production, and which could be improved by the installation of more powerful engines. Consequently, large orders were placed for Hawker Hinds and for Hawker Demons with Kestrel V engines of 600 h.p. New types had also to be adopted, and the Air Ministry boldly took new measures for cutting down the great length of time which used to be taken in the more spacious days of economy between the production of a type and its actual delivery to squadrons. Certain types were ordered straight off the drawing boards of designing firms, before even a prototype had been produced. In two cases arrangements were made for converting civil types of outstanding performance into Service machines. These were the Bristol 142, which will become a medium bomber, and the Avro Anson, which has become the first type of the new class of general reconnaissance aircraft. The Anson, as explained above, does not add directly to the strength of A.D.G.B., and No. 48 (G.R.) Squadron, which is equipped with it, is under the control of the School of Air Navigation at Manston (a new formation), which in turn is under the Inland Area Command. The Gloster Gladiator fighter and the Vickers Wellesley medium bomber are two of the new types ordered for A.D.G.B. We shall doubtless hear about other orders before long.

So far as the aircraft went, the expansion has called for intensive work and clever organisation, but it has been a fairly straightforward affair. The expansion of the personnel has been a rather more complicated business. In May last year, when the expansion was started, the strength of the R.A.F. was 32,000, of whom 2,700 were pilots. In the two years of the expansion the Force required a normal entry of 700 pilots and an additional 1,800 to man the new squadrons. A certain number of these pilots would need to be permanent officers, and the University Air Squadrons of Oxford and Cambridge were told to accept any suitable men who intended to apply for permanent commissions. But there was also the chance that a limitation of Air Forces might come about, and the Air Council did not mean to commit themselves too deeply. It was decided that the great majority of the pilots must be on a short-service basis, airmen pilots as well as officers. In ordinary times the short-service officer engages for six years' service "with the colours" and four years on the reserve. For the expansion pilots, this order of things has been reversed, and they engage for four years in uniform and six years on the reserve. Out of the total of 1,800 pilots required, it was decided that roughly about 25 per cent. might be airmen pilots, and the latter also engage for four years' active and six years' reserve service.

To engage men direct from civil life for training straight away as airmen pilots is a complete innovation in the R.A.F. Previously, the airmen pilots had all been selected from serving airmen, and mostly from what are called ex-apprentice airmen—that is to say, men who have been through the apprentices' schools at Halton and Cranwell. This direct entry of airmen pilots is one of the most radical

In addition to the four Reserve schools operating before the expansion, eight new ones are being established; several, including Desford (Leicester), at which this photograph was taken, are already in full operation. The Desford school is operated by Reid and Sigrist, Ltd. (*Flight* photograph.)



The Vickers "Wellesley" medium bomber (Pegasus XVIII), in which the famous geodetic construction system is employed, is another type for which a considerable order has been placed.

steps taken to secure the full supply of personnel.

The response of the country to the call for pilots has been good. Up to January 18 last the Air Ministry had received 4,800 genuine applications for short-service commissions and 1,350 for service as airmen pilots. Out of these 760 officers and 205 airmen pilots have been selected, so that already more than the 1,800 required have been secured.

Naturally the ordinary recruiting organisation was not nearly large enough to deal with these thousands of applications, and the first step of all was to establish new recruiting offices. These have been opened in London (Victory House, Kingsway), Glasgow, Newcastle, Manchester, Liverpool, Birmingham, Cardiff, Plymouth, Portsmouth, Belfast and Leeds. These offices have been kept very busy, and it is hardly surprising that some applicants have had to wait a while before their applications could receive attention.

Having secured the pilots, the next thing was to train them. By the old arrangements all S.S. officers and airmen pilots were sent to a Flying Training School. During the economy régime the F.T.S. at Netheravon had been closed down, and that at Digby had been reduced to a "care and maintenance" basis. These two were set going full blast again as quickly as possible, and, in addition, two more F.T. Schools have been opened at Peterborough and Wittering. To make room at Wittering, the Central Flying School was moved from there back to its original station at Upavon. Yet another three F.T. Schools are due to be opened this spring, at Montrose, Thornaby, and Ternhill. These, with the schools at Grantham and Sealand in this country, and Abu Sueir in Egypt, make a total of ten available for training S.S. officers and airmen pilots.

In the economy days the F.T. Schools used to undertake *ab initio* flying training. But even ten F.T.S. were not thought capable of giving that training to all the new pilots. The supply of qualified instructors in the Service could not be multiplied by a stroke of the pen, and the quality of the instructors is all-important. Accordingly it was decided that elementary flying training should be given to all pilots (except the Cranwell cadets and the University candidates) at civilian flying schools. Previously there had been four civilian schools which looked after the flying of pilots on the reserve, those at Hatfield, Filton, Brough and Hamble. Others have been opened, or are on the point of opening, at Ansty near Coventry, Yatesbury, White Waltham near Maidenhead, Sywell near Northampton, Perth, Woodley, near Reading, Desford near Leicester, and Ayr. The course at these schools lasts for fifty-six days, in which fifty hours' flying must be put in. Instrument flying, aerobatics and cross-country work are taught, while ground instruction is given in engines, rigging, navigation, armament, photography, etc. After passing through one of these schools the pilot goes on to a F.T.S. for advanced instruction, and the S.S. officers are also taught the duties of an officer, so that each may leave the school fully capable of taking up work with a squadron. A short course in drill and such matters is given at Uxbridge.

The establishment of the School of Technical Training at Halton has been more than doubled. In this *Flight* photograph Halton apprentices are seen watching wind-tunnel recording apparatus.

Another Halton glimpse—apprentices at the forge. (*Flight* photograph.)

The provision of aircraftmen has also required much energy. There are two classes of aircraftmen, tradesmen and aircraft hands. For a supply of tradesmen the R.A.F. depends chiefly on the two schools for apprentices at Halton and Cranwell, but the lads spend three years at these and so they could not do much to help in the two-years expansion scheme. The numbers at Halton are being raised, none the less, from 1,200 to 2,550 in residence. At the last passing-out 171 apprentices became aircraftmen, but at the last examination no fewer than 1,036 lads were admitted to the two schools and another large number will be taken in next May.

The Air Ministry had to turn to direct enlistment to secure the 20,000 tradesmen and aircraft hands which were required in the two years. First they applied for skilled mechanics to be trained as fitters and riggers, and the upper age limit of applicants was placed as high as 42 years. Next there was need for semi-skilled men, such as garage hands, for training as mates, flight mechanics, and flight riggers. These have to be between 18 and 32 years. Of these two classes about 1,300 men a quarter were needed.

The third step was to enlist about 400 young men every quarter for training in the trades of armourer, wireless operator, and photographer. They have to be between 17 and 32 years old, and to be up to the standard of a secondary school education. On acceptance they are sent

One of the new Reserve schools seen from the air—White Waltham, near Maidenhead, operated by the De Havilland Aircraft Co., Ltd. (*Flight* photograph.)

to train at either the Electrical and Wireless School at Cranwell, the Air Armament School at Eastchurch, or the School of Photography at Farnborough.

Up to January 18 nearly 8,000 men had enlisted. In addition, over 1,000 airmen re-enlisted, as provided for in the scheme, and so the numbers are keeping well up to requirements.

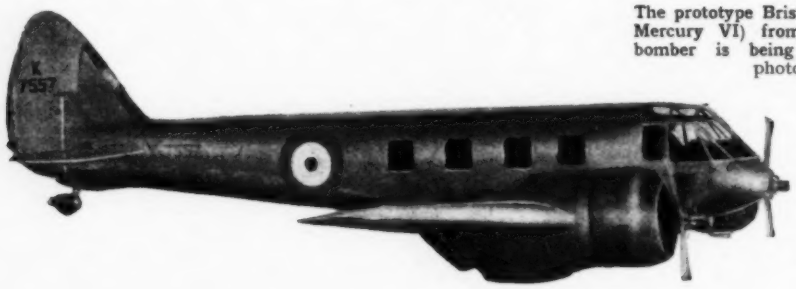
Good progress has also been made in finding new aerodromes. They had to be selected on a definite plan, fighter squadrons being placed round the area which they have to defend, and bomber squadrons in convenient places for starting their operations without getting in the way of the fighters and confusing the observers who are on the look-out for enemy bombers.

Up to the end of last year the following new stations had been selected:

Cranfield, nr. Bedford.	Marham, Norfolk.
Church Fenton, nr. Leeds.	Montrose.
Debden, nr. Duxford.	Manby, Lincs.
Dishforth, nr. Ripon.	Odiham, Hants.
Eastburn, Yorks.	Shawbury, nr. Shrewsbury.
Feltwell, Norfolk.	Scampton, Lincs.
Finningley, nr. Doncaster.	Stradishall, Suffolk.
Harwell, Berks.	Ternhill, Salop.
Hemswell, Lincs.	Thorney Island.
Hullavington, Wilts.	Upwood, N. of Wyton, Hunts.
Leconfield, nr. Hull.	Wyton, Hunts.

New squadrons entailed more armament training camps, at which live bombing and air gunnery could be practised, as the three camps at Sutton Bank, North Coates Fitties, and Catfoss were obviously insufficient. Such camps have to be on desolate stretches of coast, and trouble has arisen because on such stretches it often happens that rare or interesting birds congregate. Sometimes there are also archæological remains, as well as fishing interests. From ornithologists, archæologists and fishing interests bitter complaints have gone up when the Air Ministry has decided to establish a bombing and shooting range. However, camps are to be established at Chesil Beach in Dorset, Hellsmouth in Carnarvonshire, Luce Bay in Scotland, and probably near Lindisfarne in Northumberland.

And what of the squadrons? So far eight regular bomber squadrons have been formed as well as one regular fighter squadron and one regular general reconnaisance squadron. Three auxiliary bomber squadrons will form during February. The new squadrons are: No. 38 (B) Squadron at Mildenhall, No. 97 (B) Squadron at Boscombe Down, No. 102 (B) Squadron at Worthy Down, No. 214 (B) Squadron at Andover, No. 215 (B) Squadron at Worthy Down, No. 21 (B) Squadron at Bircham Newton, No. 34 (B) Squadron at Bircham Newton, and No. 104 (B) Squadron at Abingdon. It may be stated that the last four will be light bomber squadrons. No. 74 (F) Squadron has been formed at Hornchurch. No. 48 (G.R.) Squadron at Manston is not under A.D.G.B. The auxiliary bomber squadrons are: No. 609 (West Riding) at Yeadon, No. 610 (County of Cheshire) at Hooton Park, and No. 611 (West Lancashire) at Speke.



The prototype Bristol 142 (two 605 h.p. Mercury VI) from which a medium bomber is being developed. (*Flight* photograph).

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for publication in these columns.

Pity the Private Owner

UNDER the heading "Private Flying" in *Flight* of January 23, "Indicator" raises some interesting points which bear on the slow increase of private ownership. I think that most private owners will agree that the use of an aeroplane is greatly reduced by the fact that spare parts are not only extortionate in price but also only available after weeks of waiting. I have in mind the push-rod of a well-known engine which was supplied after a delay of three weeks for the modest price of £6 10s. Any motor manufacturer could supply a similar part for less than 5s., and by return.

There is no doubt that weather is rather unfortunate in England. I would suggest that if a few aids could be arranged for the pilot in fog his dangers would be vastly reduced. In the first place, all high-power cables should have at their bases a chalk square or similar marking, and at intervals of, say, five miles, these squares should contain the name of the nearest aerodrome with its distance and bearing. Secondly, the names of towns should be marked in a definite position in all cases—for example, directly to the west and near the main railway or road entering from that direction; thus, it would be very easy to find. The favourite position at present is apt to be a gasometer surrounded by gloom and factory chimneys. Finally, since mineral lines are from the air practically like all other railway lines, they should be plainly marked on maps, and in no case should the marking of a railway be interrupted for a name to be written across it.

J. R. MICKLETHWAIT.

Leeds.

"Commercial Efficiency"

I WAS particularly interested in Mr. E. N. B. Bentley's article and formula for assessing the "commercial efficiency" of aircraft, as published in *Flight* of January 9, and I felt that Mr. Bentley appeared to have overlooked several important factors, which, I suggest, makes his formula of far less value. However, Mr. W. D. Brown, of Hove, follows up with a letter published in your issue of January 23, which seems to have abused the use of the formula.

In the first case, Mr. Brown publishes a list of figures he has calculated with Mr. Bentley's formula, and in this list I find a number of errors. I will quote one instance—the Monospar—which is shown as a three-passenger machine instead of a four, based on the other figures, the commercial efficiency should read 5.786 as against 4.047.

Mr. Brown is particularly impressed with what he terms "the remarkable commercial efficiency attained by the Miles aeroplane." This is apparently made so obvious by drawing up a list of aircraft irrespective of whether they are single- or twin-engined machines. It must surely be clear to Mr. Brown that the suggested commercial efficiency on the formula described for a single-engine four- or five-seater machine is bound to be much higher than a twin-engined machine of the same passenger capacity, but with considerably greater safety factor, and therefore greater commercial value. Mr. Brown's table is, I venture to suggest, useless for comparison purposes when applied for feeder-line work or air-line operation, and, in any case, the number of passengers in Mr. Bentley's formula is given as the number which can be carried in ordinary air-line work when the aeroplane is also equipped with luggage and lavatory accommodation.

To refer to Mr. Bentley's article. Generally speaking, I suggest the formula is not practicable, as it fails to embrace some of the most important factors which air-line operators must consider. For instance:—

(1). The general safety factor as applied to single-engined versus multi-engined aircraft.

(2). The construction of the aircraft in relation to depreciation as applied to: (a) wood and fabric; (b) metal and fabric; (c) all-metal.

(3). The relative maintenance costs of: (a) engine, (b) airframe, with due regard to time lost due to overhaul schedules, annual C.'s of A., etc.

(4). Essential equipment. Prices quoted for the basis of calculations appear to include standard equipment, but in most cases this does not allow for blind-flying instruments, wireless, etc., which may be said to be essential for aircraft operators.

I agree that the business man who intends to run an air transport company on a commercial basis is not directly interested in the percentage structure weight, relative merits of fabric or stressed-skin covering, and so on, but he has to keep constantly in mind two important features—the cost per machine mile and the cost per passenger mile. It so often happens when machines have to run with one or two passengers, or even none at all, that the cost per passenger mile ceases to be an economic factor. The alternative is, to my mind, a basis of calculation to show all costs including operating and administrative costs on a daily basis, which, when divided by the daily flying hours of respective machines shows immediately an economic factor for comparison purposes with different types of aircraft.

In the booklet of Monospar Economics published by General Aircraft, Limited, detailed information is given of aircraft operating costs in a comprehensive manner which the business man can understand. The basis of the cost is per flying hour, and it illustrates how, in a very simple manner, it is possible to keep track of operating costs by daily schedules of flying hours for all machines. As Mr. Bentley points out, the question of speed is an important factor, but it does not become an economic one until regular payable loads of passengers can be anticipated

Many air lines, in their earlier stage of development, find the greatest difficulty in obtaining any traffic at all which can honestly be classed as regular. Perhaps the reason for this is the fact that most air lines at present operate upon the basis of infrequent journeys over a given route, thus the much vaunted saving in time becomes an illusion for the majority of potential travellers. Instead of the craving for higher speeds an alternative would appear to be to tackle the matter from an entirely different angle and ensure that the basic plan to be adopted is that of high frequency in transportation between any two points. The whole problem then assumes an entirely different complexion, and for services of this nature I suggest small aircraft with their attendant reduction in overhead costs and the frequency which offers a saving in time throughout the whole of the day, so meeting the needs of the majority of travellers or shippers of goods and commodities. Small, inexpensive aircraft involve much smaller capital outlay, and the replacement of small craft in due course by slightly larger craft as traffic increases, or with the addition of extra units as it becomes necessary, is a matter of comparative ease from financial and other considerations. High frequency enables greater flexibility to be obtained, and peak loads can be more readily met than by any other system.

Hanworth. S. J. NOEL-BROWN.

That Gliding Subsidy

IN your issue of January 30 the honorary general secretary of the Federation of British Gliding Clubs writes about the gliding subsidy in timely relation to the annual meeting and elections of the British Gliding Association. In the best electioneering tradition the taxpayer is "enlightened" by "a few facts"—as usual, too few, either for enlightenment or in proportion to the statements made.

The peroration: "The purpose for which the grant was made is, at the moment utterly defeated," must be related to the Federation's own notion of that purpose, expressed as follows: "In aid of those clubs which have shown themselves effective but, nevertheless, were unable to carry on without aid."

Effective for what? And to whom shown?

The purpose of the subsidy scheme, as approved by the Secretary of State for Air, is the furtherance as efficiently as possible of the gliding movement in Great Britain.

Any possible national importance or development of gliding can be founded only upon glider pilots, and the first essential is to increase their somewhat meagre numbers. The ability to train members for the elementary R.Ae.C. Glider Pilot's Certificate was, therefore, chosen as the soundest qualification

for public help in the first year or two; this not only because a stronger core of pilot-experience is necessary, but also because this ability implies several other possessions at least as vital to success as money. Among them are a suitable gliding site, a certain membership, enthusiasm, adequate instruction and maintenance, and good management.

The lack of any of these invites failure, and because the State can supply only money, elementary requirements for the others were laid down to avoid waste of subsidy funds.

Previous financial failure—although not to be over-rated as an omen of subsidised success—is no bar to the subsidy provided other essentials are present in reason; but the prime need is an efficient nucleus of clubs, founded on previous success and well distributed geographically. These become clearing houses of experience and training grounds of instructors for those clubs which at present find the qualifications "definitely exclusive" and are therefore not yet good public investments.

The subsidy is granted only for capital assets such as site, buildings, gliders and training equipment, and a percentage must be borne by the club. All claims must be supported by documents as to cost, delivery or completion, condition, etc., before the trustees may approve them, and the fact that the Federation considers these ordinary business usages "restricted and absurd" illustrates their necessity.

A Club and the Subsidy

Another item in *Flight* of January 30 provides an example. A member club of the Federation demands an enquiry into the subsidy administration, and stoppage thereof in the meantime.

This club asked for subsidy. In reply to enquiries it repudiated as wasteful formalities such things as approved chief instructor, approved ground engineer, agreement ensuring the use of a gliding site, services of an accountant, and R.Ae.C. Glider Pilot's Certificates. This attitude is no doubt sincere, but a less honest club dealing with more trustful trustees might well cause the taxpayer to sit up and repudiate the wasteful formality of issuing subsidy cheques.

No good election is complete without a modicum of class hatred, so familiar-sounding charges of opulence and ill-faith are levelled by your correspondent against a body identifiable as the London Gliding Club. They concern me only as they impugn the subsidy administration of the British Gliding Association.

The L.G.C., with more than 250 members, includes a few "of means"; but the taunt of bloated wealth is misguided. Success came not from riches but from some years' hard pulling through the doldrums of inexperience. Only comparatively recently has it borne fruit in those spectacular flights upon which, the letter alleges, the club bases its claim of efficiency. So it may, partly, but these flights *have no bearing whatever on the subsidy*, which is allotted solely on pilots trained in the preceding year. They merely help the club to qualify for that disqualification which the Federation would impose upon success.

The insistence of the Air Ministry on the reaffiliation of the L.G.C. before entrusting to the B.G.A. the administration of the subsidy is attributable not only to the fact that the L.G.C. included considerably more than half the certificated glider pilots in the country, but also to the experience which led to its admitted success, and could not lightly be ignored for the task in hand. The reforms in the B.G.A., demanded by the L.G.C. before consenting to "gain readmission," were submitted to the Air Ministry and all found desirable, being the outcome of difficulties overcome—by no great margin at times—during the past six years. Precisely the same difficulties have reduced many clubs to being "unable to carry on without aid."

The subsidy scheme, as now in effect, exploits proven capability as a quicker and less wasteful means to more and better gliding than the repetition at public expense of the same old mistakes in thirty localities at once.

In the latter half of 1935 were issued 182 Glider Pilot's Certificates. Of these 162 were gained by trainees of the four clubs already qualified for subsidy. The purpose of the grant is not being defeated.

F. D. BRADBROOKE,
Honorary Secretary, The British Gliding Association, Ltd.
London, S.W.1.

Autogiro Efficiency : Forced Landings

IN your correspondence columns in *Flight* of January 16 two letters interested me greatly, namely, "Autogiro Efficiency" by Mr. James Buchanan, and "Forced Landings" by Mr. W. E. P. Johnson. In the first instance I would like to ask one or two questions that I have never been able to answer to my own satisfaction, and in the second I would like to put forward one or two suggestions.

Regarding fixed wings there are aircraft in operation capable of lifting forty to sixty passengers, whereas I think I am correct in stating that Autogiros have not exceeded 10 per cent. of that lift. Direct-control Autogiros are at present limited to *one* rotor, apparently, as the control of the aircraft is seriously hampered if a greater number is employed; in fact, it almost appears that normal controls would have to be reinstalled in such a case.

In view of the fact that aircraft of from 50 to 200 tons are under discussion as a practical proposition commercially I would be very pleased to know if any technical expert can inform me whether a multi-rotor Autogiro is a sound possibility, or, if a single rotor can be designed to withstand a 50- to 200-ton lift. If not, then I do not see a great future to auto-rotation.

Turning now to the matter of forced landings I entirely agree with the suggestions put forward by Mr. W. E. P. Johnson, but, in addition, I think there is another trait evident in some pilots which will account for a number of the type of accidents under discussion. The subtle and dangerous factor to which I refer is "pride," and it is sometimes disguised as "over confidence."

In a genuine forced landing the pilot's mind is fully concentrated on one objective, namely, to get into the field in one piece, and his judgment is not impaired by any outside influence. In an ordinary landing in a small field the proud (or over-confident) pilot frequently slightly misjudges his approach and, in addition, has either a passenger in the machine or friends on the ground whom he wishes to impress. Whether the approach is rumbled or otherwise he finds himself slightly overshooting, either due to rumbling in too fast or coming in too high; then, instead of putting his pride in his pocket and his engine on, and going around again, he determines to sit down at any price—which is generally fairly high. He then generally either fails to stop and hits the far hedge or puts his engine on too late and hits it harder still; or he endeavours to sideslip very low and late and probably touches down with drift with equally damaging results!

I think that during the training period a little time spent in impressing on the pupil the fact that it is not a crime, or anything to be ashamed of, to put on one's engine and try again, is well worth while.

Power approaches should be practised as much as forced landings by a commercial pilot as they are extremely useful in avoiding any fairly steep turns or anything in the nature of aerobatic landings which are likely to disturb his passengers; therefore, I would hesitate to rule out power approaches even for comparative beginners.

In closing, I would like to say that I would be very interested to know if Mr. Johnson or others agree with the above, as I haven't his experience, in so far as I am not an instructor.

R. P. OPIE.
Bournemouth.

Cables, Organic and Otherwise

THE increase in electrical apparatus on aeroplanes has rendered it necessary to discriminate between electric cables and those used for the mechanical controls.

The wires used for transmitting movements in old-fashioned organs were called "trackers," and I would suggest the use of the term "tracker cables" for those used on aeroplanes.

Portsmouth. W. H. LAWES.

In Brief

Provided that sufficient support is forthcoming it is proposed to form a gliding club for Croydon and the surrounding district. A site for primary training has been selected and in due course an effort will be made to start soaring in earnest. Those interested should get into touch with Mr. F. Lindsley, of 132, Coldharbour Road, Waddon, Croydon.

* * *

Commenting on a recent paragraph regarding the fitting of night-flying equipment as standard, General Aircraft, Ltd., point out that the S.T.25 ("Jubilee") Monospar is not only fitted with night flying equipment as standard, but also with radio, including homing device. They claim to be the first manufacturers of twin-engined aircraft in the world to sell a fully equipped aeroplane as standard. A "Jubilee" Monospar, they point out, can be bought just in the same manner as one buys a car; it can be flown away directly from the works, finished in every detail, complete with all necessary equipment, for an inclusive price.

Private Flying

Topics of the Day

Radio Again

A FORTNIGHT ago I touched rather lightly on the various problems surrounding bad-weather navigation in the special case of the private owner or the amateur pilot who has hired a machine. I suggested that some sort of communication system was essential for him if he was not to be kept out of the air on an unreasonable number of days of the year.

Obviously, some form of homing device, for use either with existing broadcasting facilities or with the short-wave track beacons which are now being installed at various airports in this country, is not complete in itself. If private owners without two-way radio are to come hurtling down the beam tracks towards crowded aerodromes there is trouble in store for them, and the moral restrictions on their bad-weather travels will be considerably increased.

Only a very small amount of actual information is necessary for his safety and for the safety of the more important air services. Primarily, he must know whether the airport towards which he is heading is under Q.B.I. conditions and, if a landing is permissible, when he may safely enter the area.

Broadcast Information

IT would seem that the regular weather broadcast from Daventry might be arranged to include definite statements on the first point at certain equally definite time intervals—say every half-hour *at* the half-hour—and the normal homing receiver could then be used to obtain this information.

To those who say that the careless owner might not bother to listen in I shall say that there is nothing at all to stop him now from flying into any controlled area without permission and that he values his own life just as highly as he values the lives of air line passengers.

Nevertheless, it must be admitted that two-way conversation provides a much more comforting method of obtaining information, and if conditions are not "too Q.B.I." he might obtain permission to land during a lull in the arrivals of more important machines.

To have to land outside one of the controlled areas—and I am visualising an increase in the number of these as a natural result of increased air line activity—and to telephone for permission to approach is a very clumsy way of doing things. After all, the sky might close in even while the pilot was walking back across the aerodrome to his machine after obtaining the necessary permission. In any case, it would seem that, eventually, flying instruction will have to cease at certain of the busier terminal airports. A school which can only carry on in more or less perfect weather is hardly one at which really proficient amateur pilots will be turned out.

Short-wave Possibilities

FOR small machines the short-wave type of two-way equipment is the immediately obvious solution, since the shorter the wave the smaller and lighter is the necessary set. Furthermore, as the owner is not usually an electrical engineer, the set would need to be easily operated, with a single tuning dial and a single three-way switch for transmission, reception, and "off."

There is nothing very impossible about that, but to whom will the pilot speak? The existing ground stations are designed to work in the region of the normal aeronautical wavelengths and special sets would have to be installed at all the aerodromes and airports, though these sets would not require the services of a professional operator.

In the paper which he read last week before the Airport's Conference, Mr. Roderick Denman, the technical director of Airwork, rightly stressed the value of a close working partnership between the pilot and the control and praised the American system whereby the control officer could speak directly to the pilot even before the machine left the ground. Telegraphy has a number of advantages, but it can never take the place of actual speech for short-range work while taking off or while landing—when immediate information may sometimes be essential to the safety of all concerned.

Mr. Denman also suggested the use of short-wave equipment for this purpose, and mentioned, without much enthusiasm, the idea that "refusal of permission to land" signals might be made by switching the approach beacon on and off. The more obvious objections to this course are that the information would then be given at a very late stage in the proceedings and that the incoming pilot might merely imagine that his receiver was at fault—or he might not even bother to imagine anything at all!

The Important Owner

THE immediate questions are: Is the private owner worth all this trouble and expense, and will the little bit of available short waveband be jammed with television before anything can be done to aid the owner? I think he *is* worth all the trouble, and, if a movement is made immediately, the television services may be controlled in time.

He is worth the trouble because he is still, to a large extent, the corner stone of the whole flying business, and out of his enthusiasm there often arises the really valuable air transport concerns. If everything is to be left in the hands and minds of the aeronautically impractical financier we may see something within the next few years beside which the South Sea Bubble will appear as a mere—bubble. And if it bursts it will shatter much more than itself.

INDICATOR

Private Flying

FROM the CLUBS

Events and Activity at the Clubs and Schools

HANWORTH

MR. S. TOPALIAN, a visitor from Iraq who is taking an instructor's course through the Hanworth Club, is housing his American Bird (Kinner engine) in the Club hangar. Last week's flying times totalled 31 hr. 10 min.

C.A.S.C.

Although no flying was possible before lunch on Sunday due to poor visibility, five members flew 1 hr. 45 min. dual and 3 hr. 20 min. solo. Mr. F. R. G. Spikins renewed his "A" licence.

BENGAL

During December, 1935, Club-owned aircraft flew 91 hr. 20 min. Miss Mrinalini Bonnerjee, another Bengalee lady, is taking dual instruction. Messrs. Ray, Piekenbrock and Gloeckle have gone solo. Flying times were 34 hr. 35 min. dual, and 56 hr. 25 min. solo.

CAMBRIDGE

Thirty-two hours were flown by Marshall's Flying School and the Cambridge Aero Club during the week ending February 1. Messrs. Hickman, Soloman and Blackburn became members.

REDHILL

Mr. F. Overeijnder has gone solo and Mr. R. F. Stone has passed the Hendon tests for his "B" licence. Forty-five hours and ten minutes were flown during the week ending January 31.

CASTLE BROMWICH

Mr. J. Ginder has gone solo, and Mr. P. J. Danielsen and Mr. A. W. Harley have become members. Flying times last week amounted to 9 hr. dual and 4 hr. 55 min. solo.

BORDER

Unfavourable weather has limited the activities of the Border Flying Club. Mr. Prescott and Mr. Hodgson, both of Carlisle, have qualified for their "A" licences. Mr. Beattie has joined as a flying member and has started instruction.

YORKSHIRE

During the fortnight ending January 31, fifteen hours' flying was recorded. Mr. A. L. T. Naish has joined as a country member and Mrs. M. L. Brown, an Aviation Group Member, has gone solo. The Hillson Praga was among the visiting machines. The dance arranged for January 25 has been postponed until February 8, but the film show arranged for January 26 took place as scheduled.

SOUTH COAST

Being rather early in the year for the usual Dawn Patrol, a cocktail patrol was held last Sunday. Machines from Wilmington, Ford and Brooklands attacked. A landing competition is being arranged for Sunday, February 9. Mrs. Chamberlayne, Miss Goodman and Mr. Phillips joined the Club last week, during which flying time amounted to about 15 hr.

COTSWOLD

Rumour has it that building operations will soon start "across the road" on the municipal airport site. Miss T. Wills and Mr. K. F. MacDonald have passed their "A" licence tests, and the following have become members: Miss R. Smith, Messrs. L. G. Bailey, V. H. Hanschell, C. D. Miller, W. J. Peachey, J. Perrot, and F. Phillpotts. January's flying time was 45 hr. 50 min.

HAMPSHIRE

The Hampshire Aeroplane Club flew 120 hr. 50 min. during January on its five machines. Miss M. L. E. Oke and Mr. K. Lancaster became members; Mr. H. F. Montgomery went solo; Messrs. H. E. Harding and G. Verdon-Roe qualified for their "A" licences; Mr. R. C. W. Ellison passed his blind-flying instructor's course. There will be a fancy dress party at the clubhouse on Saturday, February 8.

NORFOLK AND NORWICH

Flt. Lt. T. K. Bullmore took up his duties as chief instructor last Saturday. An informal dinner is being arranged for February 7 for those who wish to meet him. Flt. Lt. Bullmore intends to specialise in blind-flying training, and will also give a series of short lectures on navigation, compasses, map reading and kindred subjects. The next supper dance will be held at the Club on Friday, February 21.

YAPTON

The partially waterlogged aerodrome kept flying time down to twelve hours during January. Of these, nine represent solo by the more experienced members on the few favourable days. Miss H. M. Harrison and Mr. E. C. Heath have become members. Miss Harrison, who owns a Miles Falcon, which is being housed in the Club hangar, intends to take her "B" licence and her instructor's certificate.

LONDON

The flying time for last week was 59 hr. 15 min. Messrs. J. H. Hestan, J. E. Scoular, G. L. Horne and H. G. Moffat became members.

PORTSMOUTH

Mr. Powis brought a Miles Hawk Trainer to the Portsmouth Aero Club on Sunday, January 26, for demonstration. Mr. Munday came in a B.A. Eagle. Messrs. Sorrell and Ricketts became members last week, during which flying time was 11 hr. 30 min.

LIVERPOOL

In face of severe wintry conditions, the Liverpool and District Aero Club flew 110 hr. 40 min. during January at Speke and Hooton Park aerodrome.

ROYAL AIR FORCE

In view of the death of King George V, the Royal Air Force Flying Club has cancelled the dinner which was to have been held at the R.A.F. Club in Piccadilly on February 21 and its annual display which was fixed for June 6. Air Vice-Marshal A. S. Barratt, C.M.G., M.C., Wing Cdr. F. W. Stent, M.C., and F/O. D. G. W. Somerville, have joined the Club.

TOLLERTON

Capt. C. W. Cudemore made a number of flights last week on behalf of the Press in connection with the Royal Funeral. On Thursday Mr. Ramsay Smith completed the tests for his "A" licence, and on the same day Mr. R. G. Robertson, winner of the *Nottingham Journal* flying scholarship, made a successful first solo. The Rev. J. W. Pyddoke, the oldest member, made his first flight last week since his recent severe illness. Both he and Mrs. Pyddoke are enthusiastic members.

BRISTOL

On January 31 the Bristol and Wessex Aeroplane Club took delivery of two new B.A. Swallows which were flown down from Hanworth against a 60 m.p.h. head-wind and violent storms by the chief instructor, Mr. E. M. H. Slade, and the chairman of the flying committee, Mr. A. H. Phillips. Both reported the worst flying weather they had ever encountered, but were full of praise for the behaviour of the machines under such conditions. Solo charges on these aircraft will be 30s. an hour, or 27s. an hour before 2 p.m. on any day except Sundays and Bank Holidays.

CINQUE PORTS

Although Lympne aerodrome has a small patch of ground which has been marked off as unsuitable for landing and taking off, users have been more fortunate than at many other places. Mr. Roger de Pury, an old war time pilot who gave up flying at the end of the war and only recommenced late in 1935, has taken his "A" licence.

The Club has had official intimation from the Air Ministry that it may take over the other half of its hangar, and the plans which have been prepared for the extension of the Club premises are to be put in hand immediately. Provision has been made for new offices, a new dope shop and new workshops.

READING

The Sparrow Hawk has been making a few fast trips at its cruising speed of 160 m.p.h. Capt. Birkett used it last Tuesday to fly photographs of the Royal Funeral to Manchester; on Thursday Mr. Miles took it to Paris, and Mr. Whitney Straight put it through its paces over the week-end. Mr. Van Den Heuval has taken delivery of his Falcon Six. Last week's flying times totalled 32 hr. 45 min. Mr. Gill took his blind-flying certificate and Mr. J. Douglas-Cooper started on his blind-flying course. The rugger team of the Reading Aero Club and Phillips & Powis won its match against Reading University, the score being 12-0.

BROOKLANDS

The annual general meeting of the Club last Saturday was remarkable for its informality. Mr. A. Percy Bradley was in the chair. A number of members made an impassioned (but firmly refused) plea for cheaper solo flying for those of riper years and sober judgment. Support was promised for a guarantee fund toward the construction of a swimming pool, a project which, at the moment, bears a strong resemblance to carrying coals to Newcastle.

The flying return has improved with the weather. New members are Messrs. Cliff, Rumsey and Baillie, all for instrument flying. Messrs. Baillie and Brenridge have passed their night flying tests, Mr. Brenridge now having completed all the tests for his "B" licence. First solos have been made by Mr. Steve ("Shell") Mellstrom and Mr. Lawson. Mr. Truscott has taken his "A" licence.

On February 9 there will be an aerial treasure hunt which is to be open to members of other clubs. There will be a small entrance fee and prizes of flying time will be awarded to winner and runner-up. The winner will also receive a cup presented by two members of the Club.

LANDING on AIR

An Undercarriage Compression Leg with Many Interesting Features

MUCH development work has already been carried out in all countries in connection with shock-absorbing struts for aircraft undercarriages, and the modern compression strut gives results very different from those obtained in the earliest days of flying with rubber cord wrapped around the wheel axle. The rubber *was* light for the energy it would absorb, but that was all that could be said for it. It was very "snatchy," owing to its lack of hysteresis, and resulted in bouncing in anything but a perfect landing. Modern requirements are not only for good shock-absorbing qualities but also need adequate damping on the return stroke. As the sinking speed of aircraft increases with the use of flaps and other devices, these requirements are likely to increase in severity.

An undercarriage leg which has attained great popularity in Germany, where it is used extensively on Junkers, Dornier, Messerschmitt, Henschel, A.T.G., and Hamburger Flugzeugbau machines, is the Faudi. This leg is also fitted on the Heinkel He 70 and on the new twin-engined Heinkel He 111 described in *Flight* recently. The British rights to manufacture the Faudi leg were acquired some time ago by Turner's Motor Manufacturing Co., Ltd., of Wulfruna Works, Lever Street, Wolverhampton, and already this firm has manufactured a considerable number of these legs, which have been used on various British machines with very good results. It would appear that soon the Turner leg, as it is called in this country, will be as popular here as it already is in Germany.

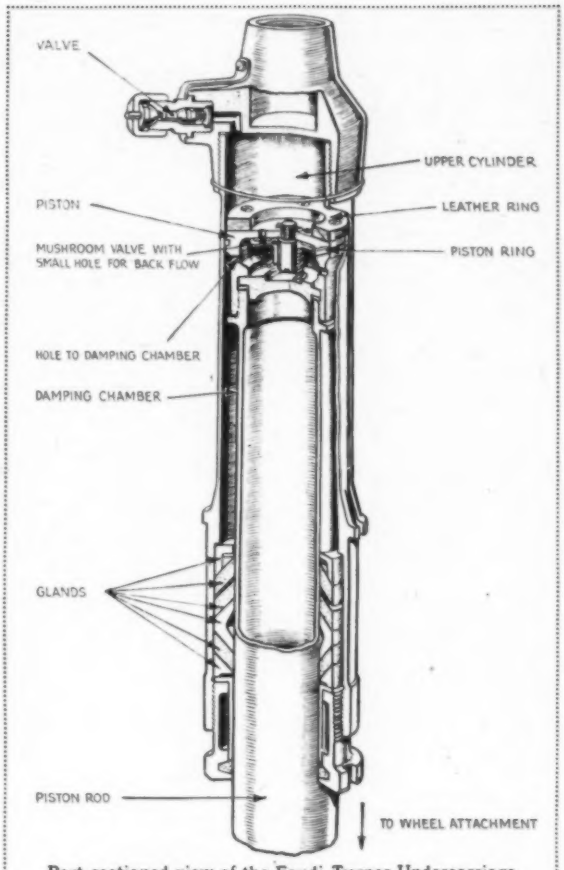
The Turner leg is an "all-air" telescopic member which comprises a cylinder in which is working a stepped piston having a tubular piston rod of slightly smaller diameter than the piston itself. The cylinder space above the piston is the compression chamber, and the annular space between the lower cylinder wall and the piston rod is used in connection with damping the rebound.

Air is pumped into the compression chamber above the piston through a valve, either by pump or from an air bottle. The piston is forced downwards until a predetermined pressure is reached. At the lower end of the cylinder, air-tightness is maintained by a number of glands soaked in a special oil before they are inserted, and kept lubricated by a layer of oil above them.

The action of the Turner leg is as follows: When the aircraft lands, the first movement of the piston compresses the air in the upper cylinder chamber. When the pressure reaches a certain figure it overcomes the spring under the flat mushroom valve, which is lifted off its seat and admits the air to the annular space below the piston. The fact that the air has to pass through holes in the piston skirt and through the narrow annular space around the lower end of the piston skirt, before reaching the larger annular space below, causes a certain amount of turbulence, which has the effect of absorbing additional energy.

The first landing shock forces the piston up above its normal position, and the high pressure tends to return it. Before it can do this, however, the piston has to displace the air which was forced into the annular space around the piston rod during the compression stroke. The pressure of air closes the mushroom valve, and the only access which the lower air has to the compression chamber is through one small hole in the valve. Consequently the return of the piston to its normal position is retarded, with the result that the "bounce" is taken out of even a hard landing.

A range of legs is available to suit different aircraft, and an extensive testing plant has been installed at the Turner works in addition to the manufacturing equipment, so that purchasers may be assured of satisfactory service. Normally it is not, of course, necessary to send the legs back for servicing, but after prolonged use it may be found advisable to have them thoroughly overhauled and checked by the manufacturers, who undertake renewal of the rubber glands, testing for air-tightness, friction and so forth. It is recommended that a small quantity of oil should be injected after every fifty landings.



Part-sectioned view of the Faudi-Turner Undercarriage Leg.

Forthcoming Events

Feb. 12. Yorkshire Aviation Services Country Club: Dinner and Dance, 8 p.m., Grand Hotel, Harrogate.
Feb. 13. Civil Aviation Service Corps, No. 1 (London) Sqn. Dance, 8 p.m.
Feb. 13. R.Ae.S. Students' Section Lecture: "Light Aeroplane Design and Construction," by Dr. N. A. de Bruyne, 7 p.m. R.Ae.S. Library, 7, Albemarle Street, London, W.1.
Feb. 17. R.Ae.S. Lecture: "The Boundary Layer," by Prof. L. Bairstow, Institution of Electrical Engineers, 6.30 p.m.
Feb. 20. R.Ae.S. (Coventry Section) Lecture: "Variable-pitch Airscrews," by Mr. T. E. Beacham, 8 p.m., Armstrong Siddeley Canteen.
Feb. 21. Croydon Airport Staff Dinner and Ball, Greyhound Theatre, Croydon, 7.45 p.m.
Feb. 21. D. H. Aeronautical Technical School: Annual Dance, Hyde Park Hotel, London, 9 p.m.
Feb. 25. R.Ae.S. Students' Section Lecture: "Mechanical Testing of Structures and Components," by W. Tye, 7 p.m., R.Ae.S. Library, 7, Albemarle Street, London, W.1.
Feb. 28. Bristol and Wessex Aeroplane Club: Annual Ball.
Mar. 10. Royal United Service Institution Lecture: "The Development of Civil Aviation," by Lt. Col. F. C. Shelmerdine, at 3 p.m.
Mar. 19. R.Ae.S. (Coventry Section) Lecture: "Type-Testing an Aircraft" by Flt. Lt. Bulman, 8 p.m., Armstrong Siddeley Canteen.
Mar. 23. R.Ae.S. Lecture: "Welding," by R. H. Dobson. Institution of Electrical Engineers, 6.30 p.m.
Mar. 26-29. Yorkshire Gliding Club: Members' Meeting.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS AIR MINISTRY ANNOUNCEMENTS

MILITARY AND CIVIL: Singapores, Scapas and an Imperial Airways Calcutta off the Khedival Palace, Alexandria.

FUNERAL OF KING GEORGE V

The following message was sent by Viscount Swinton, Secretary of State for Air, to all Home Commands of the Royal Air Force, after King George's funeral:

"I have it in Command from His Majesty the King to convey to all officers and men of the Air Forces who participated in to-day's ceremonies his appreciation of the highly efficient manner in which they discharged their duties. His Majesty has further desired me to congratulate all ranks on their excellent appearance and bearing, which gave him great satisfaction.—SWINTON."

THE R.A.F. WREATH

The Royal Air Force wreath at the funeral of King George V was composed of reproductions of Flanders poppies with the R.A.F. pilot's badge set out in gold in the centre. The wreath was taken on Saturday, January 25, to Windsor by an Air Force officer. A card accompanied the wreath bearing the following inscription: "A tribute of loyalty and affection from the Royal Air Force."

CADETSHIPS FOR APPRENTICES

The Air Ministry announces:—

Ex-Aircraft Apprentices P. R. Hatfield, J. H. Lapsley, D. C. Maybury and T. Preston, from No. 1 School of Technical Training (Apprentices) Halton, and Ex-Aircraft Apprentice C. E. K. Hind, from the Electrical and Wireless School, Cranwell, have been selected for cadetships at the Royal Air Force College, Cranwell, on the result of the examinations held on completion of their three years' training as aircraft apprentices.

The "Viscount Wakefield" Scholarships, valued at £75 each, have been awarded to Flight Cadet J. B. Grant (on the result of the recent competitive examination for entry into the Royal Air Force College) and to Flight Cadet J. H. Lapsley. The "Hyde-Thomson" Memorial Prize, valued at £29, has been awarded to Flight Cadet C. E. K. Hind.

R.N. SEAPLANE BASE, PORT SAID, REUNION

The fourteenth annual reunion of the Old Comrades Association, R.N. Seaplane Base, Port Said, will be held in London on Saturday, February 15.

Particulars may be obtained from Norman M. Williams, Esq., 16, Shrewsbury Avenue, East Sheen, S.W.14.

FLYING ACCIDENT

The Air Ministry regrets to announce that Flt. Lt. Sylvanus George Connolly, Flt. Lt. Philip Vaughan Edwards, and L.A/C. Frank Campling lost their lives in an accident which occurred on January 27 to an R.A.F. aircraft near Port Sudan.

NEW PILOTS

Since May, 1935, the Air Ministry has up to January 18 accepted 700 short service pilot officers out of 4,800 genuine applications, and 205 airmen pilots out of 1,350 genuine applications.

Taking the limits of the present expansion scheme as from May, 1935, to March 31, 1937, the Air Ministry requires a total of 1,800 new pilots, of which about 25 per cent. may be airmen. As shown above, 905 of these have already been accepted.

Under the temporary arrangements of the expansion scheme the S.S. officers engage for four years on the active list and six years on the Reserve.

R.A.F. STAFF COLLEGE

The following officers have satisfactorily completed the thirteenth course (1935) at the R.A.F. Staff College and are entitled to the letters "p.s.a." after their names in the Air Force Lists of their respective services:—

ROYAL AIR FORCE

Sqn. Ldrs. S. D. Macdonald, D.F.C., T. M. Williams, M.C., D.F.C., L. F. Pendred, M.B.E., D.F.C., J. W. Turton Jones, J. N. Boothman, A.F.C.; Flt. Lts. G. P. H. Carter, E. D. Barnes, A.F.C., F. W. Long, J. D. I. Hardman, D.F.C., C. J. Collingwood, D.F.C., G. Harcourt-Smith, G. H. Mills, A. D. Davies, G. E. Nicholetts, A.F.C., R. H. Carter, N. A. P. Pritchett, E. S. C. Davis, A.F.C., V. Harris, W. A. D. Collingwood (Stores), H. W. Penney (Stores).

DOMINION AIR FORCES

Royal Australian Air Force

Sqn. Ldr. U. E. Ewart, and Flt. Lt. F. R. W. Scherger.

Royal Canadian Air Force

Flt. Lts. A. P. Campbell, and F. G. Wait.

Royal New Zealand Air Force

Flt. Lt. A. de T. Nevill.

The following officers of the Royal Navy, the Army, and the Indian Army, have satisfactorily completed the thirteenth course (1935) at the R.A.F. Staff College:—

ROYAL NAVY

Commanders H. F. Nalder, R.N., p.s.c., and J. R. N. Taylor, R.N., p.s.c.

ARMY

Major W. H. A. Bishop, p.s.c.

INDIAN ARMY

Capt. T. H. Angus, p.s.c.

ROYAL NAVAL STAFF COLLEGE, GREENWICH

The undermentioned officer has completed satisfactorily the course at the Royal Naval Staff College, Greenwich, which terminated in December, 1935, and is entitled to the letters "*q.s.*" after his name in the Air Force List:—

Wing Cdr. D. Iron, O.B.E.

SQUADRON BADGES.

A unit badge may be placed on aircraft and other R.A.F. property provided it has been accepted for registration by the Inspector of Royal Air Force Badges and approved by the Air Ministry. Units at present using a badge, and wishing to continue doing so, should forward a specimen to the Inspector of Royal Air Force Badges who will consider its suitability for registration under the terms of this order. A brief statement giving the origin of, and reasons for adopting, the badge should be forwarded when known.

In the event of a badge not conforming with the terms of this order, or being considered unsuitable for registration, the Inspector of Royal Air Force Badges will advise the unit regarding any minor modifications which would render it acceptable or as to the necessity for a new design.

The design of new badges and the modification of those now in use will be carried out by the Inspector of Royal Air Force Badges in direct communication with the units concerned. He will consult with the Air Historian as may be necessary and submit the design to the Air Ministry for approval before registration.

The standard frame for badges is shown in the illustration, and may be used with or without the scroll at the foot for the motto.

The individual badge of the unit will form the centrepiece of the standard frame, but will not be used separately on R.A.F. property except as stated below.

Operational units are authorised to use their individual badge without squadron number or other inscription. In order that the badge can be easily distinguished on aircraft or other R.A.F. property, a white background of distinctive shape, suitably outlined in the major colour of the badge and indicating the principal operational function of the unit, has been approved as under:—

Fighting:—
Fighter.
Fleet Fighter.
Fleet Fighter-Reconnaissance.

Bombing:—
Bomber.
Torpedo-Bomber.
Bomber Transport.
Fleet Torpedo-Spotter-Reconnaissance.

Reconnaissance:—
General Reconnaissance.
Army Co-operation.
Flying Boat.

In order to cover the incidental expenses involved, units wishing to register badges will be required to pay to the Inspector of Royal Air Force Badges the sum of ten guineas from non-public funds. This payment will cover:—

Correspondence and postage, design of badge, registration, copy in colour of the registered design for the unit, photostat copies of the design for Air Ministry records, official registration record to be kept by the Inspector of Royal Air Force Badges.

The name and address of the Inspector of Royal Air Force Badges are: J. D. Heaton-Armstrong, Esq., Chester Herald, College of Arms, Queen Victoria Street, London, E.C.

R.A.F. BENEVOLENT FUND

The usual meeting of the Grants Committee was held at Iddesleigh House, on Monday, January 27. Mr. W. S. Field was in the chair, and the other members present were: Mrs. L. M. K. Pratt Barlow, O.B.E., Air Comdre. B. C. H. Drew, C.M.G., C.B.E., Wing Cdr. C. E. H. James, M.C., and Air Vice-Marshal C. A. H. Longcroft, C.B., C.M.G., D.S.O., A.F.C. The Committee made grants to the amount of £380 19s. The next meeting was fixed for February 10.

ROYAL AIR FORCE GAZETTE

London Gazette, January 28, 1936

General Duties Branch

The following Flight Cadets, having successfully passed through the Royal Air Force College, Cranwell, are granted permanent commissions as Pilot Officers with effect from and with seniority of December 14, 1935:—P. J. K. Pike, E. Banthorpe, C. H. Press, M. P. Skinner, R. K. Jeffries, F. R. Foster, B. E. Smith-Rewse, J. A. Chorlton, R. W. Reynolds, J. G. Thompson, A. R. Atkins, D. O. F. Lumsden, J. Darwen, J. D. Green, R. M. Longmore, T. S. Rivett-Carnac, A. G. Dudgeon, G. Elsmie, J. C. Mayhew, P. G. S. Dickenson, L. Mathias, J. N. Dowland, W. L. Rowbottom, D. McIntyre.

The following are granted temporary commissions as Flying Officers on being seconded for duty with the Royal Air Force (January 20):—Lt. R. E. S. Skelton (Royal Tank Corps), Lt. A. C. G. Wimbush (Royal Tank Corps).

Lt. S. W. D. Colls, R.N., is reattached to the Royal Air Force as a Flight Lieutenant with effect from January 14 and with seniority of July 1, 1934; F/O. R. B. Brown is promoted to the rank of Flight Lieutenant (December 27, 1935); Flt. Lt. H. W. Pearson-Rogers is placed on the half-pay list, scale B, from January 6 to 20 inclusive; Flt. Lt. C. B. R. Pelly, M.C., is placed on the half-pay list, scale B, from January 14 to 20 inclusive. The short service commission of Acting Pilot Officer on probation P. T. Bozman is terminated on cessation of duty (January 24).

Medical Branch

The following are granted short service commissions as Flying Officers for three years on the active list, with effect from January 1, and with seniority of the dates stated:—E. B. Harvey, M.R.C.S., L.R.C.P. (July 2, 1935); D. S. MacL. MacArthur, M.B., Ch.B. (January 1).

D. W. I. Thomas, M.R.C.S., L.R.C.P., is granted a short service commission as a Flying Officer for three years on the active list with effect from and with seniority of January 1, and is seconded for duty at St. George's Hospital, London, S.W.1.

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

Flt. Lt. H. M. Yeatman is granted a commission in that rank in Class C (December 30, 1935); F/O. R. M. Messiter is transferred from Class C to Class A (January 6).

AUXILIARY AIR FORCE

General Duties Branch

No. 607 (COUNTY OF DURHAM) (BOMBER) SQUADRON.—J. M. Bazin is granted a commission as Pilot Officer (December 9, 1935).

AUXILIARY AIR FORCE RESERVE OF OFFICERS

General Duties Branch

F/O. G. H. Compton is transferred from Class A to Class C (January 7).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Squadron Leaders.—S. D. Culley, D.S.O., to No. 23 Group Headquarters, Grantham; for Air Staff duties, 25.1.36. A. F. James, to Electrical and Wireless School, Cranwell; for Flying duties vice Sqn. Ldr. C. F. Horsley, M.C., 22.1.36. The following officers are posted to the Royal Air Force College, Andover, for Staff course with effect from 21.1.36:—H. F. V. Battle, H. A. Haines, D.F.C., W. E. G. Mann, D.F.C., J. F. Titmas, C. W. Weedon.

Flight Lieutenants.—A. R. Combe, to Headquarters, Fighting Area, Uxbridge, 16.1.36. E. C. de V. Lart, to No. 111 (F) Squadron, Northolt, 20.1.36. A. H. Love, to No. 48 (G.R.) Squadron, Manston, 25.11.35. F. H. Shales, to No. 15 (B) Squadron, Abingdon, 20.1.36. P. W. M. Wright, to No. 3 Flying Training School, Grantham, 20.1.36. W. N. McKechnie, E.G.M., to No. 8 Flying Training School, Montrose, 17.1.36. R. E. de T. Vintras, to No. 10 Flying Training School, Ternhill 17.1.36. F. D. Biggs, to Electrical and Wireless School, Cranwell, 17.1.36. R. V. M. Odbert, to D. of T., Dept. of A.M.P., Air Ministry, 21.1.36. The following officers are posted to the Royal Air Force College, Andover, for Staff course with effect from 21.1.36:—W. J. M. Akerman, N. S. Allinson, D. F. W. Atcherley, L. K. Barnes, M.B.E., D. A. Boyle, N. Carter, G. P. Chamberlain, E. C. T. Edwards, A. D. Gillmore, S. H. Hardy, F. F. Inglis, H. W. Pearson-Rogers, C. B. R. Pelly, M.C., H. J. G. E. Proud, H. D. Spreckley, J. H. C. Wake, A. H. Willetts. W. G. Cheshire, to No. 18 (B) Squadron, Upper Heyford, 27.1.36. J. Coverdale, to Air Observers' School, North Coates Fitties, 20.1.36. D. L. Evans, M.C., D.F.C., to No. 8 Flying Training School, Montrose, 24.1.36. F. W. Sinclair, D.F.C., to Headquarters, R.A.F., Halton, 23.1.36.

Flying Officers.—C. S. Moore, to No. 8 Flying Training School, Montrose, 17.1.36. H. Pilling and F. C. Seavill, to No. 10 Flying Training School, Ternhill, 17.1.36. N. G. Mulholland, to No. 48 (G.R.) Squadron, Manston, 25.11.35. E. H. Wheelwright, to Air Armament School, Eastchurch, 21.1.36. M. F. Calder, to No. 17 (F) Squadron, Kenley, 14.1.36. W. M. Hargreaves, to No. 58 (B) Squadron, Worthy Down, 21.1.36. R. E. S. Skelton and A. C. G. Wimbush, to No. 1 Flying Training School, Leuchars, on appointment to temporary commissions on being seconded from the Army (Royal Tank Corps), 20.1.36.

Pilot Officer.—J. M. Thompson, to No. 56 (F) Squadron, North Weald, 15.1.36.

Acting Pilot Officer.—R. J. Ommanney, to No. 2 Flying Training School, Digby, 13.1.36.

Stores Branch

Flight Lieutenants.—C. L. Gilbert, to No. 11 Flying Training School, Wittering, 20.1.36. J. W. Stokes, to R.A.F. Station, Hendon, 20.1.36. H. E. Young, to No. 4 Stores Depot, Ruislip, 16.1.36. The following officers are posted to the Royal Air Force College, Andover, for Staff course with effect from 21.1.36:—F. E. R. Dixon, M.C., M. S. Shapcott.

Accountant Branch

Flight Lieutenant.—J. E. Gregson, to R.A.F. Station, Tangmere, 17.1.36.

HIGH-LIGHTS ae

Just a Few of the Things Wh eres Industries House Last Wee Ilig of the Stands Which Lent T es t

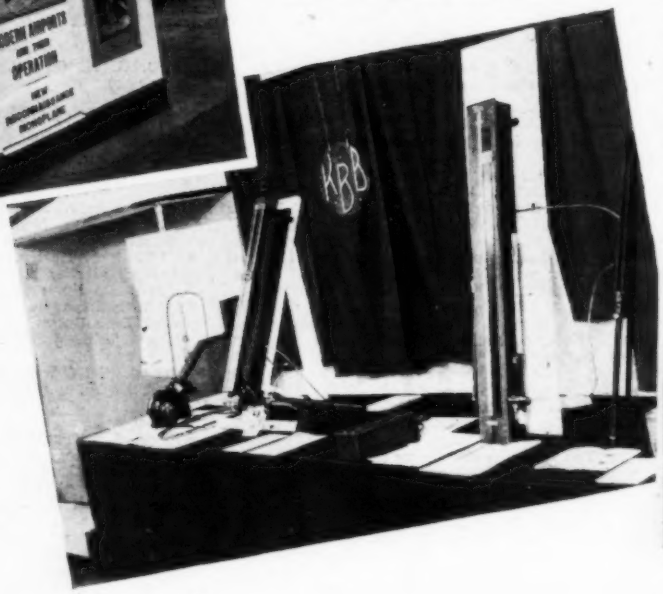
(Above) Ending in " —graph " or " — meter " and beginning with everything from " hygro— " to " anemo— " : the impressive display of meteorological instruments on the Short and Mason stand.

(Above) The Marconi exhibit. Under the signboard is the operating panel of their latest D/F receiver.

(Right) Gambrells, Rowse and Snoaden, Ltd., featured their Type 581 transmitter for medium and short wavebands.

(Above) We trust no one will accuse us of a lack of modesty in including this photograph. A lot of people seemed to find pleasant relaxation in studying the picture gallery.

If anybody was curious on the subject Pneumercator Gauges, he could seek and find enlightenment on the stand of Kelvin, Bottomley and Baird ; these instruments record fuel, oil or water levels in storage tanks.



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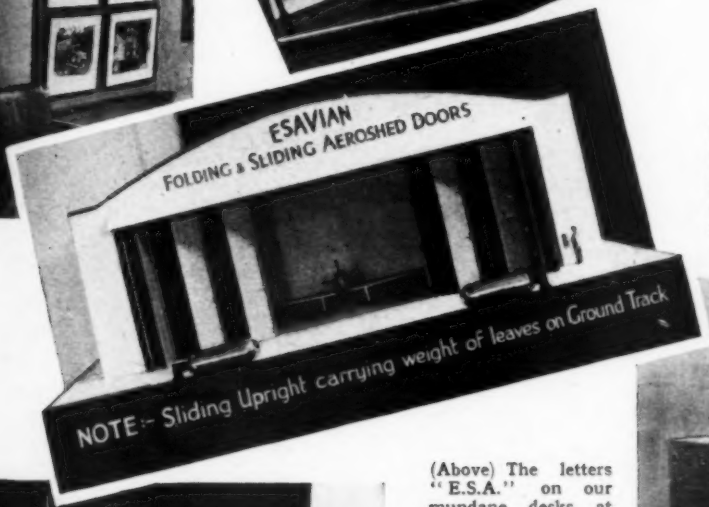
TS ae AIRPORTS SHOW

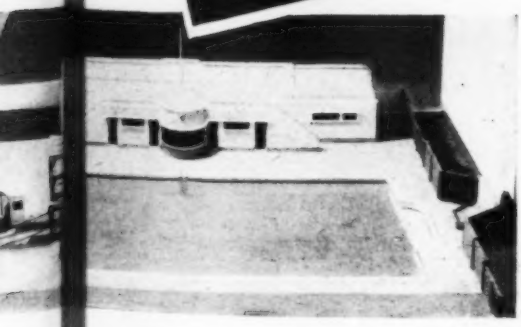
ings Wh erested the Visitors to British st Week Flight" Impressions of Some Lent T es to Photographic Treatment

A detailed products of all the Ex ed in last week's Flight"

Antithesis of the proverbial celluloid cat, the guardian of Stand 68 kept watch over fire-fighting equipment shown by the Walter Kidde Co., Ltd., who make the "Lux" gas-type fire extinguishers, and Auto Fire Protection Ltd., whose mechanical "Airfoam" pump, seen in the picture, can manufacture 400 gallons of fire extinguishing foam in one minute.

In these days froth-blowing has a new and more valuable implication, as suggested by the "Fire Froth" and other extinguishers on the stand of the General Fire Appliance Co., Ltd. This firm also specialises in what we have heard succinctly described as "decremation tools."





(Above) The letters "E.S.A." on our mundane desks at school would have been invested with romance could we have foreseen the Educational Supply Association's development of "Esavian" hangar doors. This model showed their folding and sliding methods of operation. Incidentally, a 200ft. wide by 80ft. high opening in the new Speke hangar is now being Esavianised.

Receivers and transmitters large and small—including Lorenz blind approach and Standard-Adcock D/F equipments—in the Standard Telephones and Cables display.

THE EXHIBITION in RETROSPECT

A Surprising Number and Variety of Exhibits : General Satisfaction with First Experiment : Likelihood of Annual Exhibition : Delegates Visit Croydon

THE general opinion of organisers and exhibitors at the Airports Exhibition held at British Industries House last week was that this first attempt, which was very much in the nature of an experiment, was a great success. In spite of the relatively short notice and the necessarily experimental character of the organisation, some eighty firms exhibited material and equipment needed in the establishment of a modern airport, and the range of exhibits was such as to astonish exhibitors and visitors alike. There is little doubt that the Airports Exhibition will become an annual event in future, and there is even a possibility that something in the nature of a permanent exhibition may be arranged. The management of British Industries House are working towards that end, and it seems likely that quite a number of firms may decide to take stand space permanently in the engineering section, in which many other industries are already represented.

It should be remembered that delegates from 39 municipalities visited the exhibition, that 103 organisations were represented, and a total of about 200 delegates in all inspected the exhibits. These delegates were, of course, directly interested in airport equipment, many of them being customers at the present time and others potential customers in the near future.

There is little doubt that next year the attendance will be even larger but in the meantime it is worth placing on record a list of municipalities which were enterprising enough to send delegates to the first airports exhibition in history. They were: Barnstaple, Bedford, Birmingham, Blackburn, Blackpool, Bognor Regis, Bolton, Bournemouth, Bradford, Brighton, Hove and Worthing, Bristol, Cardiff, Coventry, Derby, Doncaster, Edinburgh, Exeter, Glasgow, Grimsby, Harrogate, Hastings, Hull, Ipswich, Leeds, Leicester, City of London, Newcastle-on-Tyne, Newport (Mon)., Perth, Portsmouth, Ramsgate, Rochester, Scarborough, Slough, Stoke-on-Trent, Walsall, Watford, West Hartlepool, Wolverhampton.

The following seven air transport companies were represented: British Airways; British Continental Airways; Norman Edgar, Western Airways; Olley Air Services; Portsmouth, Southsea and Isle of Wight Aviation; British Scandinavian Airways; Aberdeen Airways.

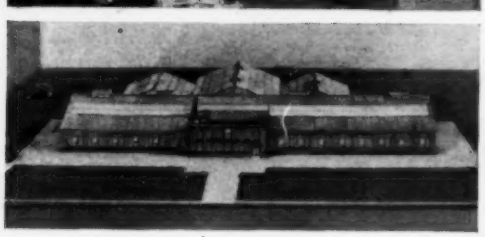
The conference period came to an end on Friday evening when the delegates and a number of the exhibitors paid a visit to Croydon aerodrome in order to study the lighting system.

The visitors, braving the Arctic wind which blows unceasingly over the plateau known as the Roof of the Airport Building, listened to a loud-speaker lecture by an Air Ministry official speaking from the control tower. He accompanied his talk by an appropriate demonstration, giving orders for the progressive ignition of the boundary lights, obstruction lights, beacon (unfortunately visible only to the lecturer and not to his audience), and fixed and mobile floodlights.

Afterwards the company adjourned to the aerodrome hotel for an informal supper, after which a few equally informal speeches (most of them prefaced with the words "I am not going to make a speech") were made. Councillor Ashley Hall thanked Air Commodore Robertson, chief aerodrome officer, for his hospitality that evening, and the latter replied, expressing the hope that what they had seen had been of interest to the delegates. Messrs. Gillman and Ashley Hall were congratulated by one of the visitors on the success of the Conference and Exhibition which, he said, must have meant an enormous amount of hard work for them. This they both modestly disclaimed.

Before returning to town most of the visitors watched the departure of the German night mail Ju.52 at 10 p.m.

MORE CAMEOS from the SHOW



(Top, left) The giant hand, well armed to drill any part of any aeroplane as full of holes as required: Desoutter Bros. showed a fine range of their portable power tools. (Top, right) Clarke, Chapman & Co., Ltd., were among those who shed light on the dark subject of airport equipment. (Bottom, left) A model of a new aircraft factory for which they are electrical contractors adorned the stand of Troughton & Young Ltd. (Bottom, right) An R.T.E. aerodrome transmitter, D/F receiver and other items on the stand of Radio Transmission Equipment Ltd. (*Flight* photographs.)

AIRSCREW DEVELOPMENT

Advantages and Disadvantages of Various Types of Airscrews and Their Material : The Latest Developments : A Summary of the General Conclusions in Dr. H. C. Watts' Lecture to the R.Ae.S.

AIRSCREW development can conveniently be dealt with under four headings: aerodynamic design, materials, adaptation to engine and aircraft, and fans for cooling and ventilation. In his lecture to the Royal Aeronautical Society last Monday Dr. H. C. Watts omitted the fourth altogether, and dealt but briefly with the first. Of the other two, however, he had a good deal to say, and very interesting it proved. Airscrew design is a highly specialised business, and it is doubtful whether the non-technical reader would be able to follow the arguments. It is, therefore, proposed to mention here only that part of the paper which deals with general principles and conclusions, and to reserve for publication in *The Aircraft Engineer* (monthly technical supplement to *Flight*) the more technical parts of the paper and the appendices.

Dr. Watts, who is technical director of the Airscrew Co., Ltd., pointed out that wood is a natural absorber of vibration and therefore an ideal material to use with an internal combustion engine with its periodic torque variations: However, it has two great disadvantages: it absorbs and gives up moisture, and it is not hard enough to resist erosion by rain, sea spray and dust. Protective finishes and metal sheathing of the leading edge have overcome these deficiencies to some extent. So protected, the life of a wooden airscrew may exceed 3,000 flying hours. For seaplane work, however, the lecturer did not consider the standard method of metal sheathing wholly satisfactory.

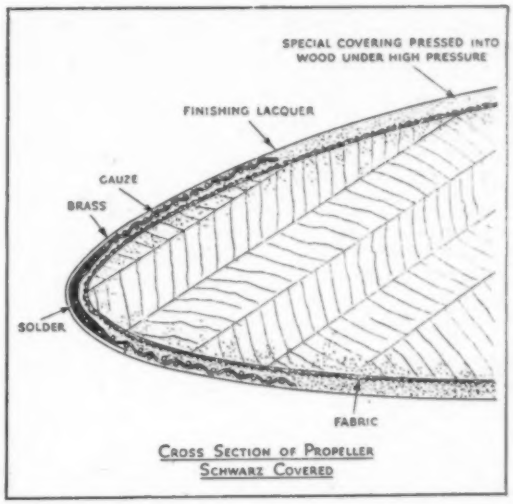
Dr. Watts then described the Schwarz process of protection, the British rights for which are held by the Airscrew Company. This consists in covering the airscrew with a film of cellulose acetate one millimetre thick. The leading edge is covered with a thin strip of cellulose material. Over this and the whole of the blade and boss is a layer of fabric or high-tensile-steel gauze. The leading edge is covered with a strip of specially woven phosphor-bronze wire gauze, to which is sweated a nosepiece of brass. The airscrew, after being thus prepared, is covered with a sheet of cellulose material which is applied in a soft and plastic condition. Adhesion to the wood is obtained by placing the airscrew in a specially designed autoclave and submitting it at ordinary temperature to a pressure of several atmospheres, varying according to the timber used. The covering is forced right into the wood, through the fabric and wire gauze, and can only be removed by tearing away the wood with the covering. The resultant surface can be highly polished, and the covering is so hard that it is impossible to stamp it with steel dies.

Compressing the Root

The finish seals the wood and prevents the rapid exchange of moisture with the surrounding atmosphere. It is as resistant as metal to erosion and abrasion, and is, of course, non-corrosive.

One of the disadvantages of wood when applied to airscrews is its low shearing strength. This has hitherto prevented the use of wood for detachable blades such as are used in variable-pitch airscrews. Dr. Watts stated that he was able to say that by an extension of the Schwarz process this defect had been overcome. The wood at the root of the blade was impregnated with a special preparation and compressed to about one-third of its original size. The compressed root was then machined to the usual cylindical form and screwed into a steel sleeve. Further impregnation under high pressure served completely to close up any clearances left in fitting the sleeve. The compression of the root was permanent; daily measurements taken at constant normal temperature of a cube of the compressed material showed no perceptible variation. The specific gravity was about 1.4, and the ultimate tensile strength 14 to 15 tons per square inch. The main portion of the blade was not compressed, and had a specific gravity of 0.5 or less, so that inertia loads were less than one-half of those of any equivalent metal blade. There was no limitation in size; a 25ft. blade for a 50ft. airscrew was practical if required.

Turning to metal airscrews, Dr. Watts recalled that the first successful departure from wood was the Reed airscrew made of aluminium alloy. The sections are very thin and the blade sufficiently flexible to set itself closely along the direction of the resultant forces, thus reducing the bending moment. Unless the material is homogeneous the deflections are unequal and unbalanced moments are set up, causing vibration. Hence the need for special dynamic balancing. Thin sections give an advantage for maximum speed but tend to lose thrust at low speeds because of lower maximum lift and earlier stalling.



Section through the leading edge of a wooden airscrew blade finished with the Schwarz process.

Following closely on the Reed airscrew came the adjustable-pitch type with blades set in a central hub. This type lends itself to mass production; for any given diameter it is possible to stock a single type of blade and obtain two-, three-, and four-bladed airscrews of any desired pitch. Owing to the cylindrical root, the true blade section does not start until well out into the blade, and this results in poor cooling of the engine behind the airscrew. The weakness of this type of blade is catastrophic failure due to fatigue.

Magnesium alloys have a specific gravity of 1.8 as compared with 2.8 for aluminium alloys, and about the same weight-strength ratio. One might therefore expect a saving in weight of 30 per cent. Considerations of flutter limit minimum thickness, and as flutter depends upon the modulus of rigidity of the material, the weight saving may be 15 rather than 30 per cent. Magnesium is now being extracted from its carbonates, of which plentiful supplies exist in this country. This fact, and the saving in weight, is forcing the development of the magnesium blade. Experience with magnesium blades has been somewhat conflicting. Some have failed in use and others have given satisfactory results over considerable periods.

Magnesium alloys corrode easily and must be suitably protected. The chromate treatment is partially effective, but the film is easily damaged and cannot be maintained along the leading edge. Rubbing down with lanoline after each flight is necessary.

It may, perhaps, be recalled that some years ago Dr. Watts was intimately concerned in the design and manufacture of the Leitner-Watts steel airscrew blade. In his paper Dr. Watts recalled that the blades produced by Metal Propellers, of Croydon, only just fell short of success. Accurate blades were produced in quantities, and their weight was low. They sustained exhaustive spinning tests, engine bench tests, and development flight trials, and yet when put into service they

failed from fatigue in less than 100 hours' flying. The fractures occurred in two characteristic places: one on the root, just outside the sleeve, and the other on the pressure face on the outer single lamination.

Concerning Micarta airscrews Dr. Watts said that Micarta was a trade name for a material made up of superimposed layers of fabric impregnated with synthetic resin. For resistance to fatigue it ranked equal with wood, but it had low torsional and flexural stiffness, and to avoid flutter the blade must have about the same relative thickness as wood, and experimental airscrews made of Micarta were comparable in weight with metal airscrews. For the hub and inner part of the blade to be of reasonable proportions it was necessary to load the material to about 3,000lb. per sq. in. This was higher than the limit of proportionality and under such stress the material "crept" and recovered but slowly from the strain after the load was removed. Thus there was risk of blade deformation, with loss of balance and interchangeability. Heated dies are used in the manufacture, and the lecturer thought that this fact would limit the manufacture at a commercial figure to large productions of one type.

In concluding this section of his paper, Dr. Watts gave a table showing the relative merits, in his opinion, of the various materials at their present stage of development. The table is reproduced in the centre of this page.

The Discussion

Mr. F. W. Johnson, of the Royal Aircraft Establishment, who opened the discussion, pointed out that the lecturer had assumed as a basis for his curves the same top speed for all the airscrews compared. By sacrificing a little of the top speed it was possible to get nearly as good results at lower speeds as with the variable-pitch airscrew and two-speed gear, without the extra weight and complication. He also referred to the trials now being carried out in this country with Schwarz-finished v.p. airscrews, and said that these were a little disappointing in the matter of weight, but had so far *run* satisfactorily.

PROPERTIES

Specific Gravity.	Mass Ultimate Strength Ratio.	Mass Fatigue Strength Ratio.	Internal Damping.	Resistance to Abrasion.	Resistance to Weathering.
Wood	Wood	Wood	Micarta	Steel	Micarta
Sch. wood	Sch. wood	Sch. wood	Wood	Sch. wood	Sch. wood
Micarta	Mag. all	Mag. all	Sch. wood	Alum. all	Alum. all
Mag. all	Alum. all	Micarta	Mag. all	Mag. all	Steel
Alum. all	Steel	Alum. all	Alum. all	Micarta	Mag. all
Steel	Micarta	Steel	Steel	Wood	Wood

ADVANTAGES

Noise.	Weight.	Safety and Dependability.	Efficiency.	Repairability.	Wear.	Possibility of Larger Sizes.	Ease of Manufacture.	Availability of Material.
Micarta	Wood	Wood	Alum. all	Alum. all	Steel	Wood	Wood	Mag. all
Steel	Sch. wood	Sch. wood	Mag. all	Mag. all	Sch. wood	Sch. wood	Sch. wood	Steel
Sch. wood	Mag. all	Alum. all	Sch. wood	Wood	Alum. all	Micarta	Mag. all	Sch. wood
Wood	Micarta	Mag. all	Wood	Sch. wood	Micarta	Steel	Alum. all	Wood
Mag. all	Steel	Micarta	Micarta	Micarta	Mag. all	Alum. all	Micarta	Alum. all
Alum. all	Alum. all	Steel	Steel	Steel	Wood	Mag. all	Steel	Micarta

Mr. Thomas, who is at present with the De Havilland company in connection with their production of the Hamilton Standard controllable-pitch airscrews at Stag Lane, took up the cudgels on behalf of solid metal airscrews. He had heard rumours that the Schwarz covering cracked, and even that there had been cases of it coming adrift from the blade. The quotation given by the lecturer from maintenance instructions issued to operators in America gave a bad impression. These instructions were written mainly for mechanics. If the mechanics would only regard the v.p. airscrew as a part of the power plant and give them the same attention the airscrews would complete the same periods between overhauls as did the engines. 3,000 hours' running was a long period for a wooden airscrew. He regarded it as a minimum for metal airscrews if properly looked after.

Capt. C. C. Walker, of the De Havilland Company, thought that wooden blades would need as much inspection as metal blades. The lecturer had been somewhat pessimistic about Micarta blades, but it should be remembered that the material was fundamentally an electric insulating material and might be improved for airscrew blades. His company had lately been running three types of blades on Hamilton hubs, one of duralumin, one of wood with Schwarz finish, and one of Micarta. The centrifugal loads in the three were 15, 14, and 12½ tons respectively. Increasing the take-off revs. of the engine was as effective as the two-speed gear.

Mr. F. C. Lynam pointed out the fact that different airscrews could only be compared if they had been designed by the same man. One could not compare weight of blades designed to be strong enough for over-revving in terminal velocity dives and so forth with the weight of the blades of a constant-speed airscrew, for instance. He thought single-seater fighters, with very low power loading, might get a good enough take-off with a fixed-pitch airscrew, but a heavily laden flying boat or commercial machine might need the variable pitch.

Herr Hoffmann, of the German Schwarz Company, explained that the Schwarz finish had given excellent results in Germany. So much so that the Schwarz airscrews had now been adopted by the Luft Hansa for their more difficult routes, such as the South Atlantic. They were also used on all flying boats. His firm had now had three years' experience of detachable wooden blades, which had been fitted to engines of up to 900 b.h.p. They were now developing a two-pitch hub which, while not giving ideal results, went a good way towards them and was fairly cheap.

Mr. Griffiths was something of a disbelieving Thomas concerning wooden airscrews running for 3,000 flying hours. He would like to know what engine it was fitted to. He had never heard of a wooden airscrew doing 1,000 hours, let alone 3,000 hours.

Mr. Hollis Williams, of General Aircraft, thought the lecturer had focused attention too much on static thrust. In modern times this was not all-important, and a comparison at a speed of about 100 m.p.h. might be more useful. The twin-engined type of aircraft was becoming very popular, and it was useful to know what thrust one could get from one engine if the other failed just after the take-off. He thought that would be the criterion in the future, rather than static thrust. The aircraft industry owed gratitude to Dr. Watts for his work in pioneering a cheaper variable-pitch airscrew. At present the industry was being held to ransom.

Mr. C. F. Hodgson, of the Fairey company, expressed disappointment with the lack of appreciation, or even mention, in the paper of the work of the late Mr. Ralli.

In replying to the discussion, Dr. Watts said that with reference to the v.p. airscrews now being tested in this country, they had, in order to save time, used blades with a larger root than he would have used had he designed them. The blades were designed for high tip speeds in a nose dive. He knew of no failure of the Schwarz covering. What might have given rise to the rumour was that on one experimental airscrew the paint had been put on too thickly and had come adrift at the tip. Capt. Walker had referred to Micarta being mainly an insulating material, and that it might be improved. He would point out that the first Micarta propeller was made nearly twenty years ago, and in that time there had been very little change in the material. He thought there must be a mistake in Capt. Walker's figure of 14 tons centrifugal pull on the Schwarz blades. The weight of the moving part of a blade was only 2½ lb., and it was difficult to see how this could cause a centrifugal pull of 14 tons. He thought it more likely that the figure was about 8 tons.

In the paper he might have been a little vague concerning the preparation used in impregnating the blade root. Actually it was very like Bakelite. The 3,000 hours' running of a wooden airscrew was accomplished on a Bristol Jupiter, and the figure was supplied to the Airscrew Company by Imperial Airways. The airscrew had been in service on the Cairo-Cape air route. A great deal depended upon maintenance.

At the B.I.F.

SEVERAL firms whose products are well known in the aircraft industry will be exhibiting at the British Industries Fair at Castle Bromwich from February 17 to 28; among them are: Desoutter Bros., Ltd., who will be showing a complete range of their portable power tools; Firth-Vickers Stainless Steels, Ltd., and Thomas Firth and John Brown, Ltd., whose displays will show the many applications of their products; Wellworthy, Ltd., of piston-ring fame; the British Oxygen Co., Ltd., with welding equipment; and B.E.N. Patents, Ltd., who specialise in air compressors, spray painting machines and various kinds of pneumatic works machinery.

RADIO and the AIRPORT OWNER

The Past, Present and Future of Radio Control : Heston's Fog Landing System : A Résumé of Mr. Roderick Denman's Airport Conference Paper

ON Friday morning, and amidst certain interruptions which must occasionally have made things rather difficult for him, Mr. Roderick Denman read an exceedingly apposite paper on "Wireless and the Aerodrome Owner." Although he did not probe deeply into any subject which might have been beyond the understanding of the ordinary man, he had gathered together all the general information which was of immediate interest to the airport owner or manager, and managed, at the same time, to tell us all a number of new things or to show old things in a new light.

The interruptions consisted largely of a lantern which at first refused to project from any position but that occupied by the front row of the stalls—minor riots being caused as the lantern moved forward like an armoured tank through the ranks of the delegates—and of a magic hand, which, from the shadows beside Mr. Denman, continued to pass up cryptic messages or glasses of water.

However, when the slides were eventually reproduced on the screen, after the lecture, the audience had a chance of realising the abject insignificance of the waveband allotted to aircraft. While describing the Lorenz system Mr. Denman made use of an excellent medium—the gramophone—in order to give everybody an idea of the sounds which were heard by the pilot as he approached the airport. A member of the staff of *Flight* who had listened to these signals in a D.L.H. Junkers Ju.52 as long ago as January of last year can only admire the excellence of the imitation and the significance of Mr. Denman's description of the sound of the second marker beacon as a "stirring call to action"!

Troubles at Le Bourget

In the course of his lecture Mr. Denman made several interesting statements concerning, for instance, the layout of Birmingham's Elmdon airport—a description of which appears on page 147—and the troubles which had been encountered with the Lorenz equipment at Le Bourget. Apparently, various underground cables and so on have completely ruined the effect of the main beam, which has been split up, so it can be seen that the installation is not without its problems. Fortunately, Heston's equipment appears to be functioning fairly well even now. The lecturer stressed the vital importance of international agreement in this problem of blind landing systems.

Wireless throughout the world, Mr. Denman explained, was controlled by a quinquennial international convention and by dependent regional agreements. Each Government recharged its responsibilities to some public body—such as the Federal Communications Commission of America—before which applicants for transmitting licences must appear. More often the Department of Posts and Telegraphs was nominated for this duty. Although in England there are working arrangements with other Government departments, all wireless stations had to be licensed by the Post Office.

The chief problem in aeronautical radio was that of interference. Electric waves resolutely refused to concede the physical reality of national or parochial barriers, only recognising those boundaries that had been imposed by Nature herself. It seemed that we could not deny to wireless messages of alien manufacture the right of free passage through our domain. Might we not, however, divert them into other channels?

Unfortunately only a very narrow band of wavelengths was exclusively allotted for aviation in Europe, and relief from congestion must be sought chiefly in the bands reserved for the "mobile" services. The term, said the lecturer, was more or less self-explanatory, but the principal occupants of these bands were the marine stations, and we could not expect that they would welcome the proposal that they should make room for aviation. Nevertheless, it was hopeless for an aircraft to attempt to make it self understood in the presence of powerful jamming from a ship's transmitter, whereas there was reason to believe that, if full advantage were to be taken of modern improvements in the radio equipment of ships, it would become possible to liberate new wavelengths for the sole use of aircraft.

Owing to power limitations, clear channels, free from all interference, were of vital importance in air navigation. He looked to those responsible for surface transport communication for a generous measure of co-operation, so that, when the next Telecommunications Conference assembled in Cairo in 1938, the Air Ministry's proposals would already have been accepted by those whom they would chiefly affect. Meanwhile our case should be very fully documented, and any experimental work necessary to support it should be put in hand without delay.

Early History

It would be evident that the Air Ministry, which stood between the Post Office and the air transport industry in the conduct of aeronautical radio affairs, had a difficult duty to perform. It was worth while to pause and enquire how that duty came to be undertaken. Under the Air Navigation Convention it became incumbent upon Great Britain to provide wireless facilities for the air services of all contracting states, and, therefore, it was a Government undertaking that the London-Continent airway radio organisation came into being. Aircraft flying elsewhere within the United Kingdom were naturally permitted to make use of the stations then provided, but it soon became evident that others would have to be erected if internal air line and other traffic were not to be discouraged.

Accordingly, in 1933, the Air Ministry entered into an agreement with the Manchester Corporation for the erection and operation of a permanent station at Barton Airport. Some time elapsed before this station began to handle a large volume of traffic, and the Air Ministry was not unnaturally reluctant to construct others while the future air routes of the country remained undefined. To meet this difficulty several mobile stations were ordered, and these have been installed at a number of aerodromes. They were contained in trailer vehicles, and could communicate with each other and with aircraft by telegraphy or telephony. Each one could be remotely operated from the receiving position, which, for accuracy in direction finding, was perferably erected upon an open site well removed from the main aerodrome buildings. These stations were to-day handling the internal airline message traffic of the country. They were supplemented by type-printing telegraph circuits between important centres in order to reduce the volume of work which would otherwise have to be discharged into the overcrowded "ether."

Turning to the nature of that work, Mr. Denman explained that the control authority must not only put the safety of one before the convenience of all, but might even have to risk the possibility of accident to one machine for the sake of averting some greater disaster. On the other hand, the pilot wanted to reach his destination punctually, safely and comfortably. His primary concern was for himself and his passengers, and he was not usually in a position to know how other machines were faring or how far, for example, the use of his radio installation to obtain some non-essential piece of information might, by creating congestion, prejudice the safety of others.

This explained the recent division of aircraft into categories in which those flying over sea were to have priority in the exchange of radio messages over those flying over land, while public transport machines were rated above private aircraft. No one wished unecessarily to deny a pilot the conveniences of radio, but such was the present state of congestion on the wavelengths employed that the Air Ministry had felt bound to give first consideration to the safety of regular traffic. It now seemed probable that they would assign a minimum height level to such traffic except when in the immediate vicinity of a terminal or intermediate landing place. The country might be divided into control areas, and all flights made above the arbitrary height level might be directed by the control officers of the areas concerned, who would make use of the existing transmitting and D/F stations and of others which would be erected later.

The area control officers would, he said, be in permanent land-line communication with each other and with the officers at the principal aerodromes, who would accept and dispatch aircraft within the area of their local control. The details of this scheme had not been finally settled, but they were expected to conform to this general outline.

Area Control Problems

Although the existing area control stations were all located at aerodromes, this was rather an accident of growth than an essential feature of current planning. It might be convenient in some cases—where there was an important aerodrome near the centre of an area—and not in others. The function of an area control station was to assist the area control officer and to provide artificial extensions to his sight and hearing. The fact that existing stations and control officers had been required to undertake local as well as area control duties had hitherto been held to justify requests for financial and other material contributions from the Government. The machinery of area control, however, was practically certain to emerge as a separate and well-defined organisation. This was being planned on a national basis, and in future the province of the aerodrome proprietors would be to ensure that they were properly equipped to handle air traffic within the area of their local control. The Air Ministry had recorded their view that the necessary wireless apparatus should not be provided by them, and Mr. Denman then went on to describe the methods of obtaining bearings and the features of the approach beacon which were detailed in the article "Radio and Traffic Control," which appeared in last week's issue of *Flight*. He stressed the fact that the importance of an aerodrome would depend upon the provision of adequate fog landing equipment, for without it absolute regularity of operation would never be possible. The necessity for avoiding mutual interference between adjacent installations, however, coupled with the difficulty of obtaining sufficient wavelength allocations in competition with television and other interests, would doubtless prove to be the deciding factor. In the layout of an approach system it was always necessary to make a careful survey of the proposed site, both from the technical and the operational points of view, before the work of installation could safely proceed. Consideration had to be given to the length and width of available runways, the direction of the prevailing wind, the height of obstacles in the line of approach and subsequent take-off, the availability of sites for the marker beacons, and the provision of power and control cables to these sites. Questions of mutual interference with other beacons and of deformations of the beam due to neighbouring conductors must also receive careful investigation.

Describing the Heston fog approach system, Mr. Denman explained that the main beacon was set up at a distance of 100 yards beyond the present western boundary and projected one track bearing 82 degrees east of north. In this direction the approaches were clear of obstructions higher than a few feet over a width of 300 yards and for a distance of 1,400 yards, while beyond this distance there were no dangerous obstructions. The beacon also projected a reciprocal track 262 degrees east of north and means were provided in the control tower for reversing the indicating signals given by the beacon when necessary.

One marker beacon had been installed in Osterley Park at a distance of three kilometres from the eastern approach boundary and a second marker has been placed 300 metres from this boundary, which was at present only 960 yards from the main beacon, though it was planned to increase the distance to 1,650 yards. The main beacon and the inner marker beacon were connected by underground power cables with the airport supply terminals, while the outer marker beacon was fed from the nearest available supply. All three were directly connected with the airport control tower, where a small monitor and control panel was installed. This panel was provided with visual and sound apparatus which repeated the actual signals emitted by the several beacons or substituted appropriate alarm signals should there be a failure in any part of the system. The beacons were left unattended and were all controlled from this one point.

A European Standard

The Lorenz system must, he said, be looked upon as the present European standard. This did not mean that our own wireless companies were prevented from entering this important new field, but it did set a high standard for British engineers to imitate or improve, and it also required us to conform to accepted international practice in regard to wavelengths and identification methods. On the whole these were well suited to British conditions and there should be no great difficulty in arranging for all-weather landings by foreign aircraft at British airports and vice versa.

Bad visibility conditions were not always caused by fog. Sometimes they were due to rain or snow, or to clouds reaching to the ground. In such cases the low visibility condition might be associated with wind and then, unless the direction of the wind was more or less the same as that of the beacon track, the aerodrome might still be unsafe for landings. Here a study of the available meteorological data would be of assistance to the investigator who might be able to devise landing aids in two or more alternative directions without calling for duplication of the electrical equipment.

While there could be no doubt that some air lines of the future would suffer less interruption by weather conditions than any form of surface transport, it was to be expected that the advance towards complete reliability, which would at first be very rapid, would then, following the introduction of one-way landing aids at many airports, slow down. All-weather travel, never likely to be accomplished with ships or trains, was now a realisable ideal of air transport operators and in future they would give their patronage to those airports which could offer them the means of its attainments. However, the rate at which all-weather landings could be handled had still to be determined.

Two-way Communication

Before a machine was admitted into a local control area in bad weather it would be necessary to obtain the consent of the airport control officer, who would need to issue appropriate instructions to the pilots of machines waiting to take off. Emergencies might arise in the event of these instructions being disregarded, or of the sudden appearance in the vicinity of the airport of an unscheduled aircraft. For this reason it would seem desirable to establish two-way communication between the pilot and the airport control. The range of a station appropriate for the purpose need not exceed fifteen miles and there were prospects of putting such an installation to other uses. For example, in a machine equipped with a radio compass the pilot could use it to determine his angle of drift when approaching along the beacon track and this would materially shorten the time taken to complete a landing.

Where an approach beacon was to be erected without the support of a two-way communication system between the pilot and the airport control officer, it had been suggested that the switching off of the beacon should be interpreted by the pilot as a signal that he must not complete the landing. This artifice was open to criticism and it was to be hoped that in such cases other precautionary measures would be adopted, as, for example, by the substitution of Morse signals in place of those normally emitted by the beacon. In general, however, two-way radio telephone communication with machines entering or leaving a local control area would be admitted to be desirable. Those who had seen airport control officers at work in America could testify to the value of a close working partnership between the controllers and the controlled, radio-telephone contact usually being made with the control tower before the machine left the ground. The equipment was not costly and

the value, even in moderately good visibility, of the power of direct speech was manifold. There was the usual problem of wavelength allocation, but for purely local working a wide choice was open. It would, however, be preferable to select for the airport transmitters waves of sufficient length to permit the use of radio compasses for drift correction by air-line pilots and for "homing" by private owners, who might carry ultra-short wave transmitting equipment to enable them to request permission to land.

Nowhere, concluded Mr. Denman, were the limits of human progress more difficult to discern than in the realms of electricity and aeronautics. To-day wireless had shown that we might safely fly even where we could not see. To-morrow, as some thought, vision itself would be restored to us. Basically, television between ground and air was but a matter of concentration for a year or two on the problem of compact design, but the benefits to be conferred by its introduction were not so apparent. Apart from the rapid transmission of such concentrated information as was contained, for example, in a weather map or a dial reading, there were few scenes which would be of special value to pilots, whose chief interest in television must be to retain the bird's-eye view in conditions of bad visibility. The limits of their ability to "see" through mist or fog would be primarily determined by the characteristics of the photo-sensitive apparatus which we were able to employ rather than by any progress, however spectacular, in the extension of our facilities for instruction and entertainment.

But if aviation had little to gain from television it had much to lose. Compelled by broadcasting interests to open up new channels of communication in the ultra-short wave band, it already found itself being jostled by those very same interests. It might be wise to plan an enquiry into the use of still shorter wavelengths for aviation before these, too, were appropriated to other uses. Present research would not altogether atone for bygone defeats, but at least it was our surest guide to future success.

THE DISCUSSION ON Mr. DENMAN'S PAPER

BECAUSE of the initial delays the discussion was not quite as long or as thorough as it might have been, but several important people made useful contributions. When calling upon the delegates, Mr. R. Ashley Hall, incidentally, suggested that a paper from Mr. Denman might reasonably be made an annual event. Certainly he is one of the few unofficial people in this country who manage to keep entirely up to date in radio matters.

Replying to Mr. Roche, of Hull, who had asked for further information about the vertical track guidance in the Lorenz system, Mr. Denman explained that different signal strengths were found in different parts of the main beam and that an instrument on the dashboard gave the pilot a clue to his position. At present there was some difficulty in holding the needle at a constant reading.

Capt. L. P. Winters, of Bristol, asked about the duplicated aural and visual signals, and the lecturer explained that both signals came from the same source and that the duplication was made for largely psychological reasons. Landings could be safely made now with a cloud height of more than 30ft.

Concerning runway lengths in connection with the system, Mr. L. F. Payne, of Southampton, asked whether 2,000 yards was not unnecessarily long, and suggested that everything depended upon the machines' characteristics. Mr. Denman replied that Elmdon's initial runway was 1,400 yards; that, technically speaking, the blind landing problem had been solved; and that it was possible to touch down every time in an area of a hundred square yards. The real problem concerned the human element.

Mr. R. J. Castendijk, the manager of Eindhoven airport, Holland, explained that, with the special short-wave approach system used there and elsewhere in Holland, sodium lights were also used to tell the pilot when he had crossed the aerodrome boundary, and said that the night mail pilots on their way to Cologne and elsewhere could always see them as they passed over. (Croydon pilots will explain, too, that the sodium lights of the Purley Way are of considerable assistance in conditions of bad visibility.—ED.)

Group Capt. W. H. Primrose, of the Post Office, explained that in Germany the system was being augmented with neon lights, and mentioned the value of the sensitive altimeter. Mr. Denman agreed that the sensitive altimeter was an essential check on the other instruments used. Mr. Sharman, whose system was described in *Flight* of November 21, 1935, expressed surprise that this had not been mentioned in the lecture—a fact which Mr. Denman regretted.

MODELS

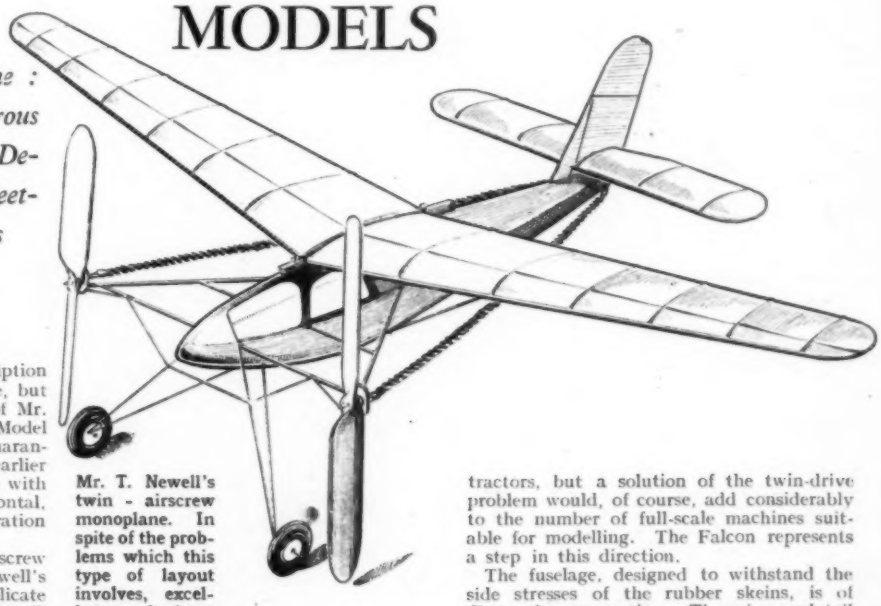
A Twin-screw Machine : Lord Wakefield's Generous Gesture : Important Decisions at S.M.A.E. Meeting : 1936 Fixtures

By M. R. KNIGHT

The Newell Falcon

THE model selected for description this month is of novel type, but the fact that it is the work of Mr. T. Newell, of the North Kent Model Aircraft Society, is sufficient guarantee of its soundness. His earlier Falcon, a high-wing monoplane with the three rubber skeins horizontal, at one time held the British duration record with a flight of 85 sec.

The latest Falcon is a twin-screw tractor, and like all Mr. Newell's machines is outstanding for delicate and beautiful workmanship. It will be of special interest to flying-scale-model enthusiasts. At present their choice of prototypes is almost entirely limited to single-engined tractors, but a solution of the twin-drive problem would, of course, add considerably to the number of full-scale machines suitable for modelling. The Falcon represents a step in this direction.



Mr. T. Newell's twin - airscrew monoplane. In spite of the problems which this type of layout involves, excellent results have been achieved.

The fuselage, designed to withstand the side stresses of the rubber skeins, is of diamond cross section. The wing and tail unit are mounted in a high position to avoid fouling the exposed skeins. An interesting feature is the use of two F.R.O.G. 3½ : 1 gears, which allow small-diameter air-

screws to be used. These gears are stocked by sundry model dealers, and satisfactorily stand up to the strain of the fully wound motors. The two gear units are soldered to an 18-gauge wire spreader, braced to the fuselage with bamboo struts, and to the undercarriage with 20-gauge wire, thus forming a rigid frame. The main members of the fuselage are of $\frac{1}{4}$in. by $\frac{1}{4}$in. hard balsa wood.

The main plane is 28in. in span, and tapers in chord from $4\frac{1}{2}$in. to $2\frac{1}{2}$in.; thus it is of lower aspect ratio than most models. It is braced to the fuselage by one light bamboo strut on each side. The main spars are of $\frac{1}{8}$in. by $\frac{1}{8}$in. hard balsa, the ribs and trailing edge are cut from $\frac{1}{16}$in. balsa, and the wing tips are of $\frac{1}{16}$in. by $\frac{1}{16}$in. split bamboo. The tail plane is 11in. in span, and 3in. in chord. The fin is $4\frac{1}{2}$in. high and 3in. wide. Both tail plane and fin are built similarly to the main plane, of balsa and bamboo.

The covering material throughout is Japanese tissue, clear-doped. It is given a final coat of cellulose lacquer to minimise the slackening effect of dampness.

The airscrews are 7in. in diameter and 10in. in pitch, one turning clockwise and one anti-clockwise. Each is powered by six strands of $\frac{1}{4}$in. strip rubber (medium). Loops of 22-gauge wire are soldered to the fixing nut on the front of each airscrew, to engage with the hook of a geared winder.

The model complete weighs 3 oz., the rubber weighing $\frac{3}{4}$ oz. The wing loading is $4\frac{1}{2}$ oz. to the square foot. The Falcon is very stable, even in high winds, and can be relied upon for a powered flight of 60 sec.

Wakefield Cup Crusaders

THE Wakefield Cup contest, held under the auspices of the Society of Model Aeronautical Engineers, is the principal event of the year in model aeronautics. It is open to teams from all countries. Models must possess 200 sq. in. of wing surface and weigh at least 4 oz. The best average duration of three rise-off-ground flights wins the Cup.

Last year the contest was held at Fairey's Great West Aerodrome, and was won by America. Gordon S. Light's lightweight cabin high-wing monoplane was timed for seven minutes, when it passed out of sight of the timekeepers, who are not allowed to follow models across country. Actually, it cruised around, with propeller idling, for 2 hr. 20 min., and then landed at Hanworth Aerodrome!

A "ways and means" committee, consisting of Messrs. H. York, C. A. Rippon and J. C. Smith, has been exploring the possibilities of sending a full team of men and models to America in June, to endeavour to retrieve the Cup, and has opened a fund for that purpose. All who are interested in model aeronautics will be pleased to learn that Lord Wakefield has added to his many benefactions by contributing £200 to the fund, thus practically ensuring that the team will be sent. This was brought about through the instrumentality of Dr. A. P. Thurston, M.I.M.E., F.R.Ae.S., etc., who for some time has honoured the S.M.A.E. by filling the office of president.

Other generous contributions have been promised, but further donations, large or small, are needed, and will be gratefully received. They can be sent to Dr. Thurston at Bank Chambers, 329, High Holborn, London, W.C.1.

The British team will be selected as the result of eliminating trials, to be held at Fairey's Aerodrome on Sunday, May 17. The team, in addition to competing for the Wakefield Cup, will also enter for the Admiral Moffett Trophy contest, which will probably take place at Akron in June.

Annual General Meeting of the S.M.A.E.

AT the annual general meeting of the Society of Model Aeronautical Engineers, held on January 16, a scheme of reorganisation, designed to broaden the scope of the Society's activities as the body appointed by the Royal Aero Club to govern model aeronautics in Great Britain, was adopted. Practically every affiliated club favoured the scheme, under which they will share the responsibilities of management.

The hon. secretary, Mr. E. F. H. Cosh, in an interesting report, mentioned that America won the 1935 Wakefield Cup contest, Great Britain came second, and France third. Australia also entered models. The Autogiro hand-launched record had been raised to 37 sec. by Mr. S. R. Crow, and an Autogiro R.O.G. record of 18.5 sec. set up by Mr. L. B. Mawby. An ornithopter record of 16.75 sec. was established by Mr. J. C. Smith. Thanks were expressed to the technical Press for valuable support.

The following officers were elected for 1936: president, Dr. Thurston; vice-presidents, Messrs. A. F. Houlberg, G. Geoffrey Smith, M.B.E., and C. R. Fairey, M.B.E.; chairman, Mr. B. K. Johnson; vice-chairman, Mr. R. N. Bullock; hon. secretary (pro tem), Mr. E. F. H. Cosh; treasurer, Mr. W. E. Evans; competition secretary, Mr. J. C. Smith; technical secretary, Mr. R. N. Bullock.

The following contests were announced for the 1936 season: Pilcher Cup (Wakefield Cup rules), April 12; Gamage Cup, May 3; Eliminating Trials* for Wakefield Cup and Moffett Trophy contests, May 17; *Flight* Cup* (Speed), May 31; *Model Engineer* Cup (Gliding), June 14; Lady Shelley Cup* (Seaplanes), June 28; C.S.S.A. Cup (Scale Models), July 12; National Cup*, August 2; Sir John Shelley Cup* (Power), August 3. Contests of a nature not yet decided will be held on August 23 and September 6.

The events marked with an asterisk will be flown simultaneously on the official grounds of all affiliated clubs wishing to take part. The others will be held centrally, on grounds to be announced.

* * *

The Skybird League announces that its annual rally will be held in the Jehangir Hall, Imperial Institute, South Kensington, on April 17. Incidentally, the latest "Skybird" construction set (miniature non-flying scale model) is of the Hestor Phœnix.

DEATH OF Mr. GAVIN GREIG

FLIGHT regrets to record the death of Mr. Gavin Greig, the secretary of the Bristol Aeroplane Company, Ltd., which took place last week at a nursing home in Bristol.

Mr. Greig, who was fifty-five years of age and a north-countryman, went to Bristol in July, 1911, as accountant for the Bristol Company, then known as the British and Colonial Aeroplane Company, Ltd. Since 1925 Mr. Greig has been its secretary, and has therefore been identified in a prominent way with the company's progress since soon after the time of its foundation.

During the whole of his period in Bristol Mr. Greig devoted his entire attention to matters connected with his work. As a result he was exceptionally well known by all identified with the Bristol Company, and individuals having business connections with the concern greatly appreciated his friendly and cheerful personality. On the other hand, Mr. Greig abstained from taking any prominent part in the public life of the city, although he was a generous contributor to the funds of any deserving cause it was always upon the understanding that his name was not made public.

He has been a Fellow of the Chartered Institute of Secretaries and attended certain social functions connected with that body, but otherwise he refrained from being personally identified with any other movements not directly connected with the business of his company. By those associated with him in business his loss will be severely felt, for he was always ready to lend a helping hand to anyone in his large circle of friends and acquaintances when occasion required. To members of the staff of the company he had acted in an exceptional degree as mentor and friend. Always approachable by even the most humble members of the staff, he put his advice at their disposal, and his help, when required, was unobtrusively given.

G.A.P.A.N.'s Message to the King

THE G.A.P.A.N.'s message of loyalty to His Majesty the King, the text of which was given in last week's issue of *Flight*, was inadvertently stated to have been signed by the Clerk to the Guild; actually, the signatory was the Deputy Grand Master, Capt. A. G. Lamplugh.

Airwork as Tank Manufacturers

AN agreement has been concluded whereby Airwork is to manufacture a quantity of petrol and oil tanks for A. V. Roe and Co. The initial order is for tanks for the Avro Anson reconnaissance bomber, which may be made of aluminium, though the use of the much lighter Elektron alloy, which is considerably more difficult to handle, is under consideration for this and future orders. Airwork is considering the large-scale manufacture of fuel tanks.